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THE YELLOWSTONE NATIONAL PARK.

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I. ITS SCIENTIFIC VALUE.

It is now generally understood that a bill was passed by the 41st Congress, by which the tract of land known as the "Yellowstone National Park" was "reserved and withdrawn from settlement, occupancy or sale under the laws of the United States, and dedicated and set apart as a public park or pleasuring-ground for the *benefit* and enjoyment of the people."

The writer of this article, having spent some weeks during the past summer in the study of the geological features of this remarkable region, has visited all its points of interest, and collected much material for the elaboration of a report, which is now in course of preparation. Dr. Hayden has already led two well equipped expeditions into this country,* while smaller parties have gathered more or less valuable material concerning the phenomena there exhibited.† The leaders of all of these expeditions

* See Geological Survey of Montana, etc, 1871; also Geological Survey of Montana, Idaho, Wyoming and Utah, 1872.

† In this connection it is but just to mention the names of Cook and Folsom, who ascended the Yellowstone valley and visited the Madison River geysers in 1869; Lieut. G. C. Doane, 2nd U. S. Cavalry (accompanying Gen. Washburn) in 1870, who reported briefly to Gen. Hancock; and Capts. Barlow and Heap, U. S. Engineer Corps, whose report to Gen. Sheridan was published in 1872. Hon. N. P. Langford, ex-governor of Montana, now superintendent of the park, has also published a number of interesting popular articles concerning its marvels.

seem to have been satisfied with the conclusion reached by Colonel Wm. F. Raynolds, who, attempting to reach this region from the head waters of Wind River without success, decided that such a route was wholly impracticable. Since 1859, the date of Raynolds' expedition, all explorers have taken it for granted that the sources of Wind River can only be reached from the head waters of Yellowstone River, by making a *détour* so as to cross the Wind River mountains through Union pass. Impressed with this idea, entrance has heretofore been made from the northward by way of forts Ellis and Bozeman in Montana, with the one exception of a portion of Dr. Hayden's command of last year, which entered by ascending the valley of Snake River, under the guidance of Mr. James Stevenson. It was natural, therefore, that much interest should attach to the results attained by an expedition, which took the field during the past summer, with the expressed intention of solving as much as possible of the mystery overhanging the structure of the unexplored territory adjacent to the park on the south and east.* The northwestern Wyoming expedition, under the command of Capt. W. A. Jones, Chief Engineer of the Department of the Platte, after an extended tour of exploration among the complicated mountain ridges of the Wind River drainage, entered the park by a new route. Ascending one of the forks of the Stinking Water† to its source in the high and rugged volcanic wall

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*The interesting geological results of this expedition are enumerated in an article by the writer, on the Geology of Western Wyoming, in the Amer. Jour. of Sci., Dec., 1873.

†I have elsewhere referred to the frequent and confusing repetition of geographical names in the west, for which no remedy seems available. I am here obliged to note that the Stinking Water *River*, to which I now allude, is an important tributary of the Big Horn, and *not* the Stinking Water *Creek* so often mentioned by Hayden, which is a tributary of Jefferson Fork of the Missouri. Stinking Water *River* is in Wyoming, Stinking Water *Creek* in Montana

While upon this subject I would ask if some measures cannot be adopted to prevent this annoying confusion of names. Why would it not be wise to substitute, as far as possible, in future maps, the more attractive Indian names for the most *abused* of those now in use? Certainly the majority of the Indian names are much preferable to their English translations.

In order to show the extent of this polynomial evil I have compiled the following list of the names of streams, which occur more than once within a distance of three hundred miles of Yellowstone Lake, all within the limits of Wyoming, Montana, Idaho, and northern Utah, but the majority are found within a radius of one hundred miles of the Park: Henry's Fork 2, Smith's Fork 3, Lake Fork 2, Bear River 2, White River 3, Powder River 2, John Day's River 2, Téton River 2, Snake River 2, Sage Creek 5, Cottonwood 3, Muddy 5, Dry Creek 4, Clear Creek 2, Sour Creek 2, Deep Creek 2, Spring Creek 3, Beaver Creek 3, Elk Creek 3, Deer Creek 2, Black-tailed Deer Creek 2, Bitter Root Creek 2, Yellow Water Creek 2, Stinking Water 2. Thus we have sixty-two *distinct* but not widely separated streams designated by the use of only twenty-four names.

on the east of Yellowstone Lake, a pass was discovered through which the pack-train was guided safely, but with considerable difficulty. This route, though in some respects preferable to the present circuitous way of entering the park, is not destined to be made available to tourists, owing to the engineering difficulties to be surmounted, and the comparatively slight saving in the distance. Upon the return of the expedition, however, a very practicable entrance was discovered, by way of the head of Wind River, from the southward. Through this new pass, which Capt. Jones has appropriately named *Tō-gō-tē*,* after our Shoshone guide, a railroad may be constructed with little difficulty to connect with the Union Pacific at Rawlins, *which would save to tourists from the east at least five hundred miles of travel in each direction.* This would render the park and the Montana settlements readily accessible, and unlock the rich mineral deposits of the Wind River valley and the Sweetwater (Wyoming) mining region. Here also a fine agricultural country is awaiting development, and already herds of excellent cattle are to be seen grazing in the rich pastures of the smaller valleys.

While traversing that portion of this region now reserved for the general public, embracing the greater number of the hot springs and geysers, I was very deeply impressed with a sense of the immense amount of time and labor which must be spent in investigating the various productions and phenomena of the park, ere we can unravel its past history or fully interpret its present manifestations. By a most fortunate, though quite accidental disposition of my time, I was enabled to pass through the most interesting portion of these wonders in such a manner as to witness and note a large number of the most striking manifestations in a comparatively short space of time. And yet when I say that I could have remained for weeks in the neighborhood of a single geyser or spring, watching closely its daily and hourly pulsations and eruptions, studying its history, and marking its effects without feeling anything more forcibly than my own ignorance, it will

*In indicating the pronunciation of Indian words I have adopted, as nearly as possible with ordinary type, the admirable and comprehensive system of Dr. C. H. Berendt, as explained in his paper entitled "Analytical Alphabet for the Mexican and Central American Languages," published by the American Ethnological Society, New York, 1869.

It should be noticed that the "*g*" in this word has the sound of the *guttural* "*j*" of Dr. Berendt, which is the equivalent of *ch* in the German *buch*.

readily be seen that my time was all too brief for the performance of the work as I desired.

Much has already been said concerning the benefits to be derived by science from the setting aside of this tract of land and the protection of its natural features. In fact this was one of the inducements offered for the passage of the bill in both houses of Congress. Dr. Hayden, in speaking of this bill says, "I believe it will mark an era in the popular advancement of scientific thought not only in this country, but throughout the civilized world. . . . . This noble deed may be regarded as a tribute from our legislators to science, and the gratitude of the nation and of men of science in all parts of the world is due them for this munificent donation."*

In this paper I propose to offer some suggestions based upon my own experience in the Yellowstone country and adjacent portions of the Rocky Mountains, tending to show some of the benefits which, in my opinion, may be made to accrue to science by the proper use of this grant. The tide of emigration, now fairly started on its westward course, is daily seeking new fields for conquest, and with the abundant treasures stored by nature in the hills and valleys surrounding our park, there can be no question that this territory is destined to become a scene of great activity at no very distant day. The Wind River valley, the greater portion of which must be traversed by any highway entering the park from this direction, is remarkably rich in mineral wealth so exposed as to make its working a problem of the simplest nature.

In a previous paper† I have briefly alluded to this fact in connection with a discussion of the prominent geological features of this highly interesting section. It is also highly probable that the once vigorous gold mining interests of South Pass and vicinity would be revived by the introduction of sufficient capital, while the markets thus produced would stimulate agriculture in a region very favorable for its successful prosecution. Nor can I doubt that the immense deposits of iron, coal, and even oil, will yet be found to be of the very greatest economic value.

In a word, it is my humble opinion that the territories adjacent to the national park will ere long be among the most thickly settled portions of the west, and that within the next decade or two

* Geological Survey of Montana and adjacent Territory. 1871, p. 102.
† On the Geology of Western Wyoming, Amer. Jour. Sci. Dec., 1873.

we may confidently hope to add to our banner another star representing a part of this region. The Montana mining settlements are already a fixed fact, and the inhabitants of the whole area alluded to, ever alive to their own interests, are rapidly developing the capacities of their soil. Dr. Cyrus Thomas, in his valuable and very interesting report to Dr. Hayden in 1871, says* "It is only after a careful examination of a vast number of experiments made in New Mexico, Colorado, Wyoming, Utah, etc., that I am forced to acknowledge what I before did not believe, viz: *that wherever there is soil in these regions, it is rich in the primary elements of fertility.*" Again he remarks,† "As a final illustration, I would refer to the efforts of the Mormons on the Rio Virgin, along the Arizonian border, where I might truly say, amid basaltic hills and drifting sands the desert is being turned into a blooming garden. Perhaps a more desolate looking region than the vicinity of St. George could scarcely have been selected; yet the application of water shows that here, as elsewhere, the soil is rich in the mineral elements necessary to fertility."

Much of the area to which I have referred requires no irrigation, while the greater portion of the remainder is very favorably situated for the easy application of water. On the plains at some distance from the mountains this process will be much more difficult on many accounts, and yet I do not doubt that even in such situations it will be attended with success when systematically practised.‡

I have thus seemingly digressed from my subject in order to show that the reservation of 3,600 square miles of that portion of this area embracing its most remarkable features was well timed, in consideration of the destructive tendencies of civilization.

The following are extracts from the report of the Committee on the Public Lands, concerning the bill providing for this reservation: "Persons are now waiting for the spring to open to enter in and take possession of these remarkable curiosities; to make merchandise of these beautiful specimens; to fence in these rare

* Geological Survey of Wyoming and contiguous territory, 1870, p. 194. Washington, 1871.

† *Ibid.*, p. 195.

‡ I take pleasure in referring the reader to the valuable reports of Dr. Thomas, which have been published with those of Dr Hayden, where the whole subject of irrigation is fully discussed.

wonders, so as to charge visitors a fee, as is now done at Niagara Falls, for the sight of that which ought to be as free as air or water.

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If this bill fails to become a law this session, the vandals, who are now waiting to enter into this wonder-land will, in a single season, despoil, beyond recovery, these remarkable curiosities, which have required all the cunning skill of nature thousands of years to prepare." If such were the danger then, how much greater would it be when the surrounding country had become thickly populated.

Having thus proven the wisdom of this liberal appropriation, let us turn our attention to a brief review of the main features of the park in its present wild condition.

First, as regards the evidences of waning subterranean heat, so abundantly manifested within the limits of this reservation. It is a remarkable fact that the springs in different localities are widely dissimilar in many respects, and even those in the same locality often differ as greatly from each other in some of their characteristics. The White Mountain hot springs of Gardiner's River are a noteworthy example of this, and did there exist no other reason for the formation of a park in this region, the fact that here the successive steps in the history of the ancient volcanic action are so clearly portrayed is alone sufficient ground for their protection. I venture to say that nowhere in our country, not even in the truly wonderful cañon of the Colorado, is so much of geological history crowded into such narrow limits, as in this portion of the Yellowstone basin. Nowhere in the world, I had almost said, is there to be found such an infinite variety with so small an expenditure of material. The area within which all this is comprised is much less than ten square miles. Some of the most interesting products are so delicate, and many of them are formed in situations so peculiar, that frequently the work of years might easily be demolished in a very few seconds. It is true that in many cases spoliation may be rectified, but there are numerous formations which have been and are now progressing so slowly, that the work of accumulation can barely keep pace with the destructive effects of natural erosion.

And yet this remarkable section furnishes but a small portion of the attractions of the park to the scientific observer. Hot and cold springs, mud volcanoes, fumaroles, solfataras and geysers,

rapids, waterfalls and torrents, deep-cut cañons and craggy peaks abound in every direction; lakes, gorges and cataracts, surprise one almost at every turn, and the whole is situated at a point where "the grand Rocky Mountain system culminates in a knot of peaks and ranges enclosing the most remarkable lake basin in the world. From this point radiate the chief mountain ranges, and three of the longest rivers of the continent, the Missouri, the Columbia and the Colorado."*

These being preserved by act of Congress, the earnest student of nature will always find an abundance of fresh matter for research in nearly every department of science. Here he will find ready to his hands a laboratory of physics in which he may observe on a large scale the action of the various forces of attraction and repulsion, and new illustrations of the correlation and conservation of energy cannot fail to attract his attention. He will find the laws of crystallization exemplified in forms novel and instructive, and will doubtless witness many new and varied phenomena of heat, light and electricity.†

The chemist will interest himself in problems of analysis and synthesis, in the processes of evaporation, condensation and solution, and the chemical changes incident thereto. To the botanist and the vegetable physiologist, the field is open for observation and wide experimentation, but there exists, even at this great altitude, a storehouse of facts bearing upon the distribution

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* Wonders of the Yellowstone, edited by James Richardson. New York, Scribner, Armstrong & Co., 1873.

† In the Geological Survey of Montana, Idaho, Wyoming and Utah, 1872, p. 121. Dr. A. C. Peale, mineralogist of Hayden's expedition of that year, notices a peculiar electrical phenomenon witnessed, or rather, experienced, by himself in company with two others of the party while ascending a peak near the Gardiner's River springs. At page 807 of the same volume, Mr. Henry Gannett thus describes this "singular experience." "A thunder-shower was approaching as we neared the summit of the mountain. I was above the others of the party, and when about fifty feet below the summit the electric current began to pass through my body. At first I felt nothing, but heard a crackling noise, similar to a rapid discharge of sparks from a friction machine. Immediately after, I began to feel a tingling or pricking sensation in my head and the ends of my fingers, which, as well as the noise, increased rapidly, until, when I reached the top, the noise, which had not changed its character, was deafening, and my hair stood completely on end, while the tingling, pricking sensation was absolutely painful. Taking off my hat partially relieved it. I started down again, and met the others twenty-five or thirty feet below the summit. They were affected similarly, but in a less degree. One of them attempted to go to the top, but had proceeded but a few feet when he received quite a severe shock, which felled him as if he had stumbled. We then returned down the mountain about three hundred feet, and at this point we still heard and felt the electricity.

and fertilization of plants, and the almost indefinite related subjects. The zoölogist and the student of comparative anatomy may also hope for rich rewards, in but partially explored fields, and the meteorologist, astronomer, artist and physician, may each find here full employment for his peculiar talent. Speaking from a geological standpoint, I can, from my own experience, promise the enthusiastic student of our earth's history a view at once so complete and so overwhelming as to enchain his whole attention.

Secondly, I consider that the Yellowstone National Park can be made a really valuable laboratory and conservatory of science at little cost and without detriment to any of the interests before mentioned.

Momentous questions are now agitating the scientific world, calling for experiment and observation which are daily becoming less possible, owing in a great measure to the obliterating influences of modern civilization. Thus it would almost seem that the present difficulties in the way of the solution of many questions, bearing upon the process of natural selection, will soon become insurmountable if some means are not employed to render more practicable the study of animals in a state of nature.

I have not space to treat this subject as it deserves, but for this and other reasons, I desire to call attention to what appears to me one of the most important uses to which the park can be put, viz.: *the preservation from extinction of at least the characteristic mammals and birds of the west, as far as they can be domiciled in this section.** The astonishing drain upon the American bison caused by the very extensive use of the buffalo robe, has led to the almost reckless waste of the life of an animal of the greatest value. I am not disposed to question the right of a nation to decide as to whether it will utilize its wild productions or supply their waste by the laborious and costly processes of civilization. We are now concerned only with the question of extinction and its relation to our researches.

If the reader will bear with me for a moment, while I bring to his notice a very few of the facts in the case, I am persuaded that he will agree with me in the statement that unless prompt and vigorous measures are instituted to check the wholesale slaughter,

*I say nothing of the reptiles, amphibians and fishes, principally because they are in much less danger of extinction, but also on account of the difficulties and disadvantages of settlement in a new region, which might result adversely.

now in progress in our western wilds, the *zoölogical record of to-day must rapidly pass into the domain of the palæontologist.* I select for my purpose only the more prominent of the many examples which might be given of animals in the west, which are rapidly becoming extinct through the agency of man—directly or indirectly at the hand of *civilized* man.

The American bison (*Bos Americanus* Gmelin), according to Rütimeyer, is identical with *Bison priscus* of the British palæolithic or drift deposits. The European aurochs (*Bos bison* or *Bison Europæus*) cannot be *specifically* separated from the latter, (*B. priscus*), however, for it is possible to trace the gradations between them. Sir J. Lubbock asserts that "the American form of bison is the more archaic."* It is, perhaps, somewhat remarkable that an ancient genus containing forms so well suited to supply man with many of the comforts and luxuries of life, should, notwithstanding the better adaptations produced by domestication and careful breeding, still be so well represented by members in a wild state.† The aurochs is now nearly extinct, but some are found in the Carpathian Mountains and the marshy forests of Poland, while it is said to be represented by a few individuals in western Asia, in the neighborhood of Mount Caucasus. Several hundred were for a long time carefully preserved by the emperor of Russia, in the forests of Lithuania, but little is now generally known concerning them, and it is to be feared that they are there nearly or quite exterminated.

The urus (*Bos primigenius*), according to one historian‡, existed in Switzerland as late as the sixteenth century.

The American bison formerly ranged over a very large portion of this country east of the Rocky Mountains, extending even to the Atlantic, and southward into Mexico. In 1862, according to Baird, "its main range was between the upper Missouri and the Rocky Mountains, and from northern Texas and New Mexico to Great Martin Lake in latitude 64° N."§ This was equivalent to an area of 1,500,000 square miles. To-day they roam over

* Prehistoric Times, 1869. p. 306.

† Besides the American bison and the aurochs there are now existing wild in India, the buffalo (*Bos bubalus* Linn), and the arnee (*B. arni* Shaw); in southern Africa, the Cape buffalo (*B. Caffer* Sparm.); in central Asia, the yak, or grunting ox (*B. grunniens* Pall.); and in the Malayan Archipelago, the banteng (*B. Sondaicus*).

‡ Heberstain.

§ Dana, Manual of Geology, 2d ed., p. 580.

portions of this wide region, but the great railroads seem to present impassable barriers, which cause them to be distributed in lots, as it were, between them. I believe it to be a fair estimate to allow them a present range, all told, of not more than 500,000 square miles, a reduction of one million square miles in twelve years. Granting the possible fact that the reduction in numbers may be in smaller proportion, and allowing for errors in the calculation, *there can be little doubt that in the next ten years this race will become extinct*, at the present rate of destruction.

The wolverine (*Gulo luscus*) also represents an ancient type, found in the bone caves of England and Belgium. It is liable to rapid extinction on account of the value of its fur.

The Rocky Mountain grizzly bear (*Ursus horribilis* Ord.) is found by Mr. Buck* to be osteologically identical with remains occurring in ancient British deposits of Post-tertiary age. This species is, perhaps, not yet scarce enough to need protection, as it is mainly confined to mountainous regions, and the flesh is not greatly in demand. It is a question, however, whether its skin will not be more frequently sought in consequence of the disappearance of the bison, or buffalo.

The American beaver (*Castor Canadensis*), hunted alike for its skin and its anti-civilization propensities, is a distant relative of *Castoroides Ohiensis* of the American Post-tertiary. Its limits, as with other animals, have been much curtailed by the advance of civilized man. It is worthy of preservation for its peculiar habits, which need no description.

The tailless hare, or lagomys, represented in the Rocky Mountain region by the little chief hare (*L. princeps* Rich), "a genus now confined to the Himalayas, Siberia, and the colder regions of North America, has been identified by Prof. Owen among the bones from Kent's Cavern, and by Dr. Falconer among those from the Brixham Cave."†

The American moose (*Alce Americanus*) the equivalent of the Norway elk (now all but extinct in Europe) is another living representative of the Post-tertiary period. Though, at present, quite abundant in this country, it is doubtful whether it can long withstand the assaults of the hunter, even with the existence of stringent game laws. The same remark will apply with even

* Geological Journal, 1868.

† Sir J. Lubbock, Prehistoric Times, 1869, p. 307.

greater force to the black-tail (*Cervus Columbianus* Rich), and the cotton tailed deer (*C. leucurus* Douglas), the prong-horn antelope (*Antilocapra Americana* Ord), and particularly to the mule deer (*Cervus macrotis* Say) which is occasionally met in this region. I might also add, with equal propriety, the mountain sheep or big horn (*Ovis montana* Cuvier) and the various *game* members of the Rodentia, as well as, in fact, all the *game birds* of this region, including the ducks, geese, grouse, etc.

The mallard (*Anas boschas* Linn.) is the only bird of antiquity included in this fauna, remains of this species having been taken from the principal lake dwellings of Switzerland.

There are numerous other animals which might be included in this protective scheme, without interfering in the least with any plans for the best improvement of the park, and, what is, perhaps, of as much importance to our practical friends to whose influence we must look for its furtherance, without any serious addition to the burden of expense.* All of these animals are more or less

*The following *partial* list comprises only the more important of the mammals and birds observed by myself during the past summer (exclusive of those already mentioned), with some few additions from the report of Mr. C. H. Merriam, Zoologist of the Snake River Division of Dr. Hayden's expedition of 1872, in order to include a portion of the fauna of Idaho and Montana:—

MAMMALS.

Felis concolor Linn.—Cougar; Puma; Catamount.
Canis occidentalis, { var. *griseo-albus* Rich.—White and Gray Wolf. / var. *nobilis* Say.—Dusky Wolf.
Canis latrans Say.—Coyote;—Prairie Wolf.
Putorius pusillus Aud. and Bach.—Least Weasel.
Putorius Richardsonii Bonap.—Little ermine.
Lutra Californica Gray.—California Otter.
Mephitis nigra Ba., var. *occidentalis* Baird.—California Skunk.
Mephitis hiemalis Gray.—Little Spotted Skunk.
Taxidea Americana Wagner.—American Badger.
Procyon Lotor Cuvier.—Common Raccoon.
Ursus Americanus Pallas.—Black Bear.
Sciurus Hudsonius Pallas.—Red Squirrel; Chickaree.
Sciurus Richardsonii Bach.—Richardson's Squirrel.
Pteromys volans Rich.—Rocky Mountain Flying Squirrel.
Tamias quadrivittatus Rich.—Missouri Striped Squirrel.
Spermophilus lateralis Rich.—Say's Striped Squirrel.
Spermophilus Townsendii Bach.—Townsend's Spermophile.
Cynomys Ludovicianus Baird.—Prairie Dog.
Cynomys Gunnisonii Baird.—Short Tailed Prairie Dog.
Arctomys flaviventer Bach.—Yellow-footed Marmot.
Ochotona saxatilis Cuvier.—Muskrat.
Erethizon epixanthus Brandt.—Yellow-haired Porcupine.
Lepus Townsendii Bach.—Jackass Rabbit.
Lepus artemisia Bach.—Sage Hare.
Lepus sylvaticus Bach.—Gray Rabbit.
Lepus Bairdii Hayden.—Baird's Rabbit. ("One very curious fact relating to *Lepus Bairdii* is that all the males have teats and take part in suckling the young."—C. H. MERRIAM.) I have never met with this species myself.
Cervus Canadensis Erxl.—American Elk; Wapiti.

BIRDS.

My geological duties were too pressing to allow of any ornithological work; hence this meagre list of Birds:

Falco columbarius Linn.—Pigeon Hawk.
Falco polyagrus Cassin.—Prairie Hawk.
Tinnunculus sparverius Vieill.—Sparrow Hawk.
Accipiter Mexicanus Sw.—Blue-backed Hawk.

liable to rapid extermination by reason of their value to man. None of them need be considered dangerous when unmolested, and, in fact, the same may be said of the whole fauna of this region, without exception.* It is only when wounded, or pressed by the severest hunger that any one with ordinary presence of mind need fear to meet the most powerful of these brutes, entirely unarmed.†

Thirdly, we have here, and may retain without the necessity of protective measures, a large number of invertebrate animals whose habits are little known, and whose structure has scarcely been investigated, and this remark will apply as well to the lower members of the vertebrate series. There is, perhaps, much reason to look for a *peculiar* fauna in this restricted region, both on account of its altitude and its comparatively isolated position, as well as the severity of the climate at certain seasons of the year.‡

Buteo calurus Cassin.—Red-tailed Black Hawk.
Pandion Carolinensis Bonap.—Fish Hawk; Osprey.
Athene hypogæa Bonap.—Burrowing Owl; Prairie Owl.
Picus Harrisii Aud.—Harris' Woodpecker.
Picoides dorsalis Baird.—Striped Three-toed Woodpecker.
Sphyrapicus ruber Baird.—Red-breasted Woodpecker.
Melanerpes erythrocephalus Sw.—Red-headed Woodpecker.
Ceryle alcyon Boie.—Belted Kingfisher.
Turdus migratorius Linn.—Robin.
Sialia arctica Sw.—Rocky Mountain Bluebird.
Agelaius phœniceus Vieill.—Red-winged Blackbird.
Piranga Ludoviciana Bonap.—Louisiana Tanager.
Mimus Carolinensis Gray.—Cat Bird.
Spizella socialis Bonap.—Chipping Sparrow.
Corvus Americanus Aud.—Common Crow.
Corvus carnivorus Bart.—American Raven.
Pica Hudsonica Bonap.—Magpie.
Zenaidura Carolinensis Bonap.—Carolina Dove.
Tetrao obscurus Say.—Dusky Grouse.
Centrocercus urophasianus Sw.—Sage Cock; Cock of the Plains.
Bonasa umbellus, var. *umbelloides* Baird.—Gray Mountain Grouse.
Cygnus buccinator Rich.—Trumpeter Swan.
Bernicla Canadensis Boie.—Canada Goose.
Nettion Carolinensis Baird.—Green-winged Teal.
Pelecanus erythrorhyncus Gm.—American Pelican.

*I make this statement advisedly, for, although I have repeatedly been exposed to attacks from predatory animals in this country and in Brazil, including the black, cinnamon and grizzly bears, the puma, jaguar, wolverine and wolf, and even the venomous reptiles such as the rattlesnake and the boa, I have always found them ready to run at my approach. The alligator, also, which has such a terrible reputation, is an arrant coward, and attacks man only when the chances are greatly in its favor.

†The protection of those animals which constitute the principal food of the more ferocious kinds would cause the occurrence of excessive hunger to become so very rare that no danger need result from this source.

I am aware that my ideas upon this subject are quite novel to many, but I believe them to be supported by the facts, as well as by the testimony of experience. My own observation, *by itself*, is of little value, but I have based my conclusions very largely upon the evidence of those whose wide knowledge of the habits of these animals in a state of nature best qualifies them to judge.

‡The lowest point within the limits of the park is probably at the mouth of Gardiner's River, about 5,400 ft. above sea level, and this is quite exceptional, being on the northern boundary line of the reservation. Yellowstone Lake has an elevation of

It is interesting to observe, however, that a very large proportion of the animals here discovered belong to species of wide range, or, if more local in their distribution, they frequently represent districts far removed. But perhaps the most remarkable feature of this distribution is that we find here living, apparently under quite similar conditions, representatives of peculiarly *southern* and peculiarly *northern* types, with some representatives of *Pacific* types.* This opens to view at once a wide field for observation upon the habits and economy of a large number of the diversified group of insects.

The stridulation of insects, and the various sexual variations and appendages, may all be here studied to the very greatest advantage. I might give from my own notes upon these and other subjects, taken while deeply engaged in arduous duties of another nature, many interesting observations which, in many cases, I was absolutely *compelled* to make, so abundant was the material everywhere present.

Fourthly, there would be much to say upon many subjects connected with the botany of this region, were it not that its elucidation has been intrusted to much abler minds than mine. Pre-

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7,800 ft., and there are numerous peaks whose altitude is nearly or quite 10,000 ft., while a number rise several hundred feet above these.

During the summer months the climate is mild and even hot in the daytime, but in clear weather the nights are very cold and frosts are not uncommon. This is due to the excessive radiation, which, during cloudy nights is, of course, much less, and the temperature consequently increased.

*The full discussion of this very interesting subject would be out of place in an article of this nature, but I cannot refrain from noticing what I believe to be the obvious explanation of this seemingly complex distribution. It must be remembered that, while this portion of country is hemmed in on all sides by high snow-clad walls, it is yet the main centre or heart of the aqueous circulation of a vast territory. The river channels of the sources of the Missouri, the Columbia, and the Colorado, cut through the otherwise impregnable rim of this basin, affording alike an outlet to the rains and melted snows, and an inlet to the insects and other animals which may by any means be forced to enter. Thus we may find, at the point from which their sources diverge, a few of the more hardy or more persecuted representatives of the lower valleys of these rivers. Were there no barriers of any kind between these points, we might expect to find whole groups of insects and the smaller animals, which had gradually moved upward and become acclimated here or even descended along the valleys of the other rivers. The facts show, however, that the representatives of distant districts now living in the Park are not thus connected in distribution with those districts. The natural conclusion, then, is that such park species are the descendants of accidentally introduced specimens which were hardy enough or fortunate enough to have completely crossed the barriers, instead of being destroyed *in transitu*. The great barrier, in this case, as remarked by Dr. Thomas, I believe to be the great plains which intervene between the head waters and the lower valleys of these great rivers, and perhaps, in one instance, the Sierra Nevada Mountains also form a barrier.

mising that Dr. C. C. Parry acted as the botanist of the northwestern Wyoming expedition of 1873, I will only add that his observations prove that the rewards of research in that department are no less promising than in other fields.

Fifthly and lastly, there is one young but active science — microscopy, — which has as yet scarcely entered this field, but which, I firmly believe, will discover within the limits of the Park most valuable treasures. The act of Congress providing for this reservation insures the preservation of the greater portion of whatever may be available for this purpose.

Among the most interesting objects for the microscope, will be found the colloidal and filamentous products of the hot springs,* the minute vegetable and animal life of both hot and cold springs, the animal and vegetable parasites, and the numerous crystalline deposits of the hot springs and geysers.

Yellowstone Lake, in many places near its borders, is so completely filled with a soft greenish substance in small pellets, that it is impossible to dip a cupful of the water without including hundreds of them. They are apparently of vegetable origin, but careful microscopical investigation is needed to determine their ultimate structure. Whether this green matter has anything to do with the presence of the intestinal worms (*Dibothrium cordiceps* Leidy),† so abundant in the trout of the lake, I cannot say, but the idea has been suggested to me from facts observed in this connection.‡ The whole subject of intestinal parasites is extremely interesting, and this particular case is, on many accounts, more than ordinarily so. The successive stages in the development of this species, and the conditions necessary to its metamorphoses, have never been studied. I can only say that I do not regard the intestinal cavity of civilized man as one of its habitats, but more extended observation of its habits may prove the contrary.

It would be a pleasant task to continue my subject much farther, but I feel that I have written all that is needed to prove the scien-

* I use the terms *colloidal* and *filamentous* to designate peculiar growths in the boiling springs, concerning the nature of which little is known.

† A description of this species, with two figures of the head, will be found in Hayden's Report on Montana, etc., 1871, p. 381.

‡ Hayden states (*ibid.*, p. 97) that these parasites are found only in the trout taken above the Upper Falls of Yellowstone River. This observation is, in the main, correct, but I have met them, *though rarely*, in those of East Fork, which leads me to suspect that they may occur in the main river below the falls. It is probable, I think, that their habitat is preëminently the lake.

tific value of the Yellowstone Park. At the same time, I am confident that I have in no degree over-estimated its value to science, but, on the contrary, I have been obliged to omit mention altogether of many points which might add greatly to the interest in this section of country, for lack of space to record them.

If anything which I may have said shall in any way aid in developing an interest in our park, or in any of the special departments of science which can there be best prosecuted with success, I shall be well repaid for my effort.

It must be remembered, however, that at present everything in this region is in a crude state, and it will be necessary to introduce gradually the requisite appliances for work, and means for the accommodation, transportation and sustenance of those who desire to work in this field. These will all come in due time, as the avarice of man leads him to discover these demands for his commodities, and in the meantime we may congratulate ourselves that the work of *destruction* is stayed.

I do not propose here to offer any suggestions nor to put forward any plans for the furtherance of scientific investigation; my purpose is accomplished if I have succeeded in making a lucid statement of the real facts of the case. In an article to appear in the succeeding number of the NATURALIST, it is my intention to enter more fully into the subject of the best methods for the improvement of this tract.

ON THE STRUCTURE AND AFFINITIES OF THE BRONTOTHERIDÆ.*

PLATES I, II.

BY PROFESSOR O. C. MARSH.

THE Miocene deposits on the eastern slope of the Rocky Mountains contain the remains of a group of gigantic mammals, of much interest, which have been named by the writer, *Brontotheridæ*.† Although these animals are less remarkable than the

*Published in part in the Amer. Jour. of Sci., vol. vii, Jan., 1874.
†Amer. Jour. Sci., vol. v, p. 486, June, 1873.

Dinocerata of the Eocene,* which they seem to have replaced, they equalled them in size, and resembled them in several important features, notably in the structure of the feet, and in having the head armed with a pair of powerful horns. The general structure of the group, however, clearly indicates that they do not belong in the order *Dinocerata*, but should be placed with the Perissodactyls, in which they form a well-marked family.

The more prominent characters of this family were pointed out by the writer in describing *Brontotherium gigas* Marsh, the type species, and others had been previously mentioned by Dr. Leidy, in his descriptions of *Titanotherium Proutii*.† The skull of the latter genus is not known, but there can now be no reasonable doubt that it was furnished with horns, in some respects similar to those of *Brontotherium* (plates i and ii). The possibility of this was originally suggested by Dr. Leidy,‡ and in his latest work he has figured a horn-core from the same deposits which yielded the *Titanotherium* remains.§ The fragmentary specimen described by Dr. Leidy as *Megacerops Coloradensis*‖ probably belongs in the same family, but until additional remains are found this point cannot be decided. The supposed genera *Symborodon* and *Miobasileus*, recently indicated by Prof. Cope (vii, p. 723), belong to this group. The former is generically identical with *Brontotherium*, the reputed absence of lower incisors being evidently due, as shown below, either to age, or to imperfect specimens. *Miobasileus* is apparently the same genus, and hence both names should be regarded as synonyms of *Brontotherium*.

Among the more marked characters of the *Brontotheridæ*, which readily distinguish them from the *Rhinocerotidæ*, apparently their near allies, may be mentioned the following:—There are four short and thick toes in the manus, and three in the pes. The skull supports a pair of large horn-cores, placed transversely, as in modern Artiodactyls.¶ There are well developed canine teeth in both jaws. The molar teeth, above and below, are not of the *Rhinoceros* type, but resemble those of *Chalicotherium*.

* AMER. NAT., vol. vii, p. 146, March, 1873.

† Extinct Mammalia, p. 206, 1869.

‡ *Loc. cit.* p. 216.

§ Extinct Vertebrate Fauna, pl. xxviii, fig. 3, 1873.

‖ Proceedings Phil. Acad., 1870, p. i, and Extinct Vertebrate Fauna, p. 239.

¶ *Rhinoceros pleuroceros* Duv., from the Miocene of France, has a transverse pair of small horn-cores on the nasals, not unlike those in *Dinoceras*. *R. minutus* Cuv. has somewhat similar processes.

The general characters of the *Brontotheridæ* are fully shown in a large series of specimens in the Yale College Museum. The cranial structure of *Brontotherium*, the type genus, is well illustrated in the nearly perfect skull of *B. ingens* Marsh, figured in plates i and ii. The only other genus of the group known with certainty is *Titanotherium* of Leidy (*Menodus* Pomel) which, according to the descriptions of that author, differed essentially in having four lower premolars, and in the absence of a third trochanter on the femur. Less important differences are seen in the composition of the teeth, and in the diastema between the upper canine and first premolar.

The skull in *Brontotherium* is elongated, and resembles in its general features that of *Rhinoceros*. The occipital region is greatly elevated, and deeply concave posteriorly. The brain cavity is unusually contracted. The top of the skull is concave longitudinally, and convex transversely (plates i and ii). The zygomatic arches are massive, and much expanded. The orbit is small, and continuous with the elongated temporal fossa. The nasal bones are greatly developed, and firmly coössified. They support entirely, or nearly so, the large divergent horn-cores. Their anterior extremities are produced, and overhang the large narial orifice. The premaxillaries are diminutive, and do not extend forward beyond the end of the nasals. The palate is deeply arched above, especially between the premolars. The posterior nares extend forward nearly to the front of the last molar. The lachrymal forms the anterior margin of the orbit. The malar extends forward beyond the lower margin of the orbit. The infra-orbital foramen is very large, and situated well forward. The zygomatic process of the squamosal is elevated, and incurved above. There is a massive post-glenoid process, and a large and somewhat shorter paroccipital process (plate i). The post-tympanic process of the squamosal is large, and quite external to the paroccipital process. The occipital condyles are very large, and well separated.

The mandible has a wide condyle, and a slender coronoid process. The angle is rounded, and slightly produced downward. The symphysis is depressed, elongated, very shallow in front, and completely ossified.

The dental formula of *Brontotherium* is as follows:—

Incisors, $\frac{2}{2}$; canines, $\frac{1}{1}$; premolars, $\frac{4}{3}$; molars, $\frac{3}{3}\times 2=38$. The upper incisors are quite small. The canine is short and stout,

and placed near the first premolar. The latter is proportionally much larger than the corresponding tooth in *Titanotherium*. The upper premolars have all essentially the same structure, viz: two external connate cusps, with their outer faces nearly plane, and two inner cones closely united. The anterior cone is connected with the opposite outer cusp by a transverse ridge, which has behind it an elongated depression, more or less divided by projections from the outer posterior cusp. In the upper true molars, the external cusps have their outer surfaces deeply concave, while the inner cones are low and separate. The lower incisors were small, and evidently of little use. The two next the symphysis were separated from each other. One specimen in the Yale Museum has the crown hemispherical in form. The lower incisors are frequently wanting, and in old animals the alveoli may, perhaps, disappear. Careful examination, however, will usually show indications of them. The lower canine is of moderate size, and separated from the premolars by a short diastema. The lower molars are of the *Palæotherium* type, and agree essentially with those of *Titanotherium*.

The head in *Brontotherium* was declined when in its natural position. The neck was stout, and of moderate length. The cervical and most of the dorsal vertebræ are distinctly opisthocœlous. The atlas is large, and much expanded transversely. The axis is massive, and has its anterior articular faces much broader than in the *Dinocerata*. The odontoid process was stout, and conical. The transverse process was small, and apparently imperforate. The posterior articular face is concave, and oblique. The epiphyses of the vertebræ are loosely united in most specimens, as in the Proboscidians. The caudal vertebræ preserved indicate a long and slender tail.

The limbs of the *Brontotheridæ* were intermediate in proportion between those of the elephant and the rhinoceros. The humerus is stout, and its entire distal end is occupied by the articulation. The olecranon cavity is shallow, and the condylar ridge similar to that of the elephant, but not continued so far up the shaft. The ulna has its olecranon portion much compressed. Its distal end is much smaller than in *Rhinoceros*, and has no articular face for the lunar. The radius is stout, and its distal end expanded. The carpal bones form interlocking series. They are shorter than in *Rhinoceros*, and support four well developed toes of nearly equal

size. The metacarpal bones are shorter than those of the *Rhinoceros*, the first phalanges longer, and the second series shorter. The ungual phalanges are short and tubercular, as in the elephant.

The femur has a small third trochanter, and its head a deep pit for the round ligament. At the distal end, the anterior articular surface is narrow, and the two edges are of nearly equal prominence, as in the tapir. There is a small fossa on the posterior side above the outer condyle. The tibia is stout, and has a distinct spine. The fibula is entire, but quite slender. The astragalus is shorter than in the rhinoceros, and the superior groove more oblique. The cuboid face is larger than in *Rhinoceros*. The navicular has its distal facets subequal. There were three toes of nearly equal size in the pes, the first and fifth being entirely wanting.

The largest known species of this group is *Brontotherium ingens* Marsh, which is represented in the Yale College Museum by a skull, nearly perfect, and other characteristic remains. The specimens preserved indicate that the animals to which they pertained nearly or quite equalled the elephant in bulk, and far exceeded in size any known Perissodactyls living or fossil.

The skull in the type specimen of the species is well represented in the accompanying plates, and its general characters have already been given. It is three feet in length, and twenty-two inches across the zygomatic arches. The most striking peculiarity of this cranium is the pair of huge horn-cores on the nasals. They are about eight inches in length, and extend upward and outward. They are triangular at the base, with the broadest face external. The two inner faces of each core are separated by a ridge, which is continued to the median line. The upper part of the horn-cores is rugose, and the base contains large air cavities. The free extremities of the nasals are coössified, and much elongated. They are rounded in front, slightly decurved, and the surface at the end is rugose. The orbit is of moderate size, and looks forward, outward and upward. The lachrymal foramen is small, and ovate in outline. The infra-orbital foramen is unusually large. There is no post-orbital process. The zygomatic arches are massive, and the squamosal portion widely expanded. The temporal fossa extends far backward, and has over its posterior portion an obtuse ridge. The occipital condyles are very large, wide apart, and extend slightly behind the supra-occipital crest. The paroc-

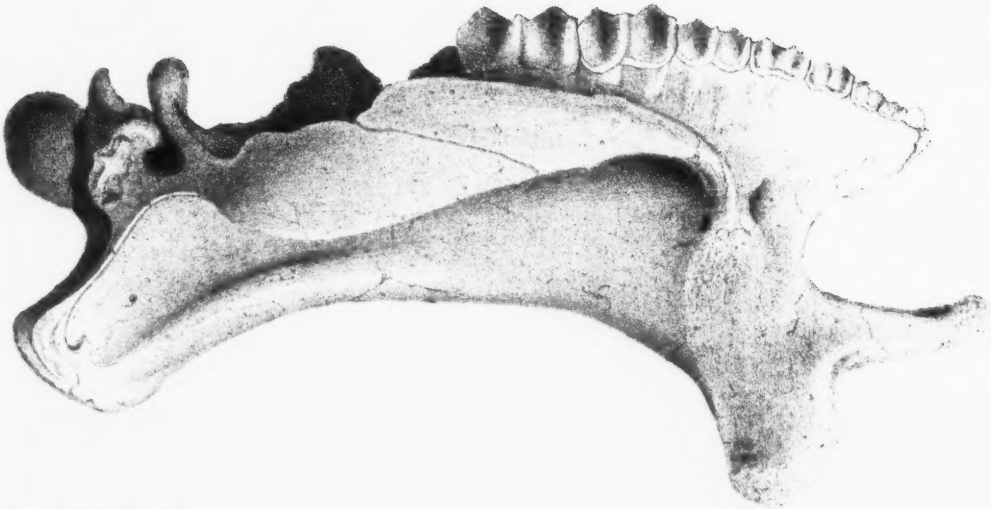
cipital process of the squamosal is elongate, and its anterior face concave. The post-glenoid process is very large, much extended transversely, and is longer than the paroccipital process.

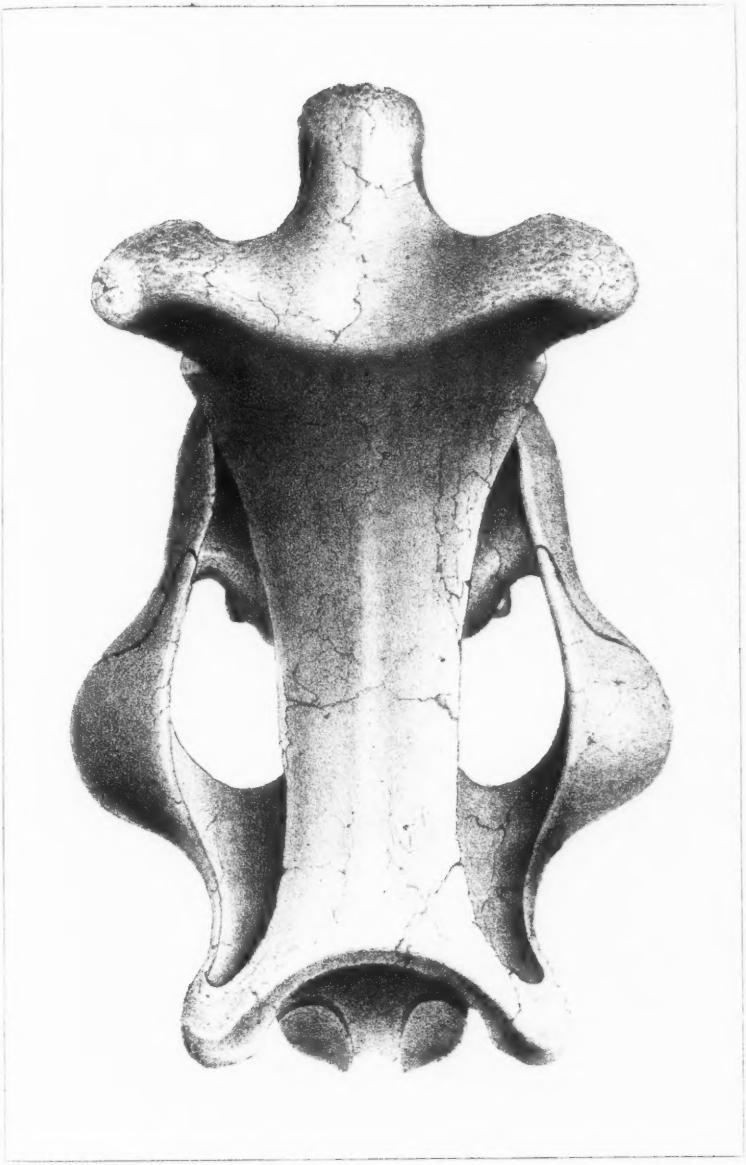
The premaxillaries in this cranium are imperfect, and the incisors wanting. The canines, also, are not entire, but they were only of moderate size, and in close proximity to the first premolar. This tooth had two fangs, and resembled the other premolars. All of these have a strong inner basal ridge. The crowns are more nearly square than in *Titanotherium Proutii* Leidy. The upper true molars are very large, the last especially so. It resembles the corresponding tooth in *T. Proutii*, but the inner posterior angle of the crown is much more developed.

The limbs in this species were shorter than those in the existing elephants, which, in form of body, it doubtless resembled. The huge divergent horns, and the absence of tusks, gave the head a very different appearance. The wide narial opening, the rugose extremities of the nasals, and the very large infra-orbital foramen, naturally suggest that there must have been an elongated, flexible nose, possibly as extensive as in the tapir. That there was no long proboscis, as in the elephant, is indicated with equal certainty by the length of the head and neck, which renders such an organ unnecessary.

This species bears some resemblance to *Brontotherium trigonoceras* (*Symborodon trigonoceras* Cope), but differs widely in size, having been nearly or quite twice as large in bulk. The horn-cores also, are very differently placed; the nasals are more elongated, and not emarginate at their extremities; the premaxillaries are not prominent; the squamosals are greatly expanded; and there is no post-orbital process.

In comparing the *Brontotheridæ* with the equally gigantic *Dinocerata* of the Eocene, several striking points of resemblance will be at once noticed: especially the presence of horns in transverse pairs; the general structure of the limbs and feet; and particularly the short and thick toes. The differences, however, between these two groups are still more marked. In the *Brontotheridæ* there is but a single pair of horn-cores, and no crest around the vertex. The structure and number of the teeth are quite different, while the small canines and huge molars contrast strongly with the elongated canine tusks, and diminutive molars of the *Dinocerata*. The latter, moreover, have two very large dependent





processes on each ramus of the mandible; the cervical vertebræ flat; the femur without a third trochanter; and an additional toe in each foot.

Among the features which this group shares with the *Proboscidea* may be mentioned: the superior extension of the condylar ridge of the humerus; the short thick toes; and the late union of the epiphyses with the centra of the vertebræ. The last character appears to belong especially to mammals of very large size, and probably indicates late maturity, and great longevity.

The preceding description makes it evident that the *Brontotheridæ* constitute a very distinct family of the *Perissodactyla*. While retaining some prominent features of their Eocene predecessors, the *Dinocerata*, they are more nearly related to the Rhinoceros family, and at the same time they have some characters allying them to the *Proboscidea*, which replace them in the succeeding, Pliocene period.

All the known remains of the *Brontotheridæ* are from east of the Rocky Mountains, in the Miocene beds of Dakota, Nebraska, Wyoming and Colorado. The specimens here described are mainly from localities in the "Bad Lands" of Colorado, which were discovered and explored by the writer in the summer of 1870.*

EXPLANATION OF PLATES.

Plate i. *Brontotherium ingens* Marsh. Side view. One-sixth natural size.
Plate ii. *Brontotherium ingens* Marsh. Top view. One-sixth natural size.

ORNITHOLOGICAL NOTES FROM THE SOUTH.

BY C. HART MERRIAM.

II. FLORIDA.

As I was in Florida but a few days and travelling most of the time, few opportunities were afforded for taking satisfactory notes relative to the breeding habits, etc., of many of the birds observed there. The route followed was up the St. John's river to Palatka and thence up its largest tributary, the Ocklawaha river, for a

* Amer. Jour. Sci vol. i, p. 202, Sept., 1870.

distance of two hundred and seventy-five miles, to a place called "Okahumkee," at the head of navigation.

For the first hundred and fifty miles the country on each side of the river is thickly wooded, the forests consisting mainly of cypress and palmetto trees: the undergrowth is very dense, and, together with the long and numerous prickly vines, forms an almost impenetrable jungle. To make matters still worse for the collector, nearly the whole country is an immense swamp, and it is very seldom that you see a little knoll rise above the level of the surrounding débris. This is, of course, the home of innumerable birds and a comparative paradise for the ornithologist.

For the remaining hundred and twenty-five miles the river runs through a vast and almost unbroken savanna: here it widens into two good sized lakes, known as lakes Griffen and Harris. A cypress or live oak is occasionally met with on this part of the river; if so, its branches (like those of the other forest trees) are adorned with large quantities of parasitic moss (*Tillandsia usneoides*), which hangs in graceful festoons to the water's edge.

Several miles back from the river (and often not so far) dry land rises out of the water and is covered with pine trees. Alligators are quite numerous about the river, both in the wooded portions and in the savannas.

The following is a list of birds met with during this excursion:

Planesticus migratorius Baird (Common Robin). Not very common. A few seen about the St. John's river. Probably breeds.

Mimus polyglottus Boie (Mocking Bird). Very common about the St. John's river and at Okahumkee. Breeds.

Lophophanes bicolor Bonap. (Tufted Titmouse). Quite common at Green Cove Spring, about the Ocklawaha and at Okahumkee.

Sitta pusilla Latham (Brown-headed Nuthatch). Very common at Green Cove Spring, on the St. John's; also quite numerous at Okahumkee. Gregarious. They seemed to be confined almost exclusively to the pine swamps and barrens, where I have often seen them moving about in flocks of from twenty to fifty. They must breed very early as I obtained the full grown young on the 15th of April. The young of the year differs materially from the adult in having the crown of the same color as the rest of the upper parts instead of brown; the white spot on the nape is also very indistinct. Their note is very peculiar and is entirely different from that of any of the other nuthatches. In habits, they resemble the pine finch (*Chrysomitris pinus*), in climbing about among the long pine leaves and alighting on and picking at the large cones. They also resemble the other nuthatches in creeping over the limbs and trees.

Thryothorus Ludovicianus Bonap. (Great Carolina Wren). Not uncommon at Jacksonville; also seen at Okahumkee. Breeds.

Mniotilta varia Vieill. (Black and White Creeper). Not common about the St. John's and on the Ocklawaha.

Parula Americana Bonap. (Blue Yellow-backed Warbler). Common about the Ocklawaha.

Protonotaria citræa Baird (Prothonotary Warbler). Quite numerous in the large densely wooded swamps of the lower Ocklawaha.

Geothlypis trichas Cab. (Maryland Yellow-throat). Common about the St. John's and the lower Ocklawaha.

Dendræca cærulescens Baird (Black-throated Blue Warbler). Common on the lower Ocklawaha.

Dendræca pinus Baird (Pine-creeping Warbler). Common at Green Cove Spring and at Okahumkee. Breeds early; fully-fledged young obtained on the 15th of April.

Dendræca discolor Baird (Prairie Warbler). Common at Green Cove Spring.

Setophaga ruticilla Sw. (American Red-tart). Common on lower Ocklawaha.

Hirundo horreorum Barton (Barn Swallow). A few seen about the St. John's.

Stelgidopteryx serripennis Baird (Rough-winged Swallow). Not uncommon about the St. John's.

Vireo olivaceus Vieill. (Red-eyed Vireo). Common at Okahumkee.

Collurio Ludovicianus Baird (Loggerhead Shrike). Quite common about the St. John's and at Okahumkee. Breeds. Its note is not unlike that of the Mocking Bird (*Mimus polyglottus*) and it is familiarly known by the natives as the Loggerhead Mocker. It can also imitate many other birds. They are most numerous in the undergrowth (when there is any) in the pine regions, and I never saw one in the swamps.

Pyranga æstiva Vieill. (Vermilion Tanager; Summer Red Bird). Observed only at Okahumkee, where it was not uncommon. It was a shy bird and was generally detected by its pleasant song, and was usually observed in the top of some pine.

Pooecetes gramineus Baird (Grass Finch; Bay-winged Bunting). Not uncommon about the St. John's and at Okahumkee.

Junco hyemalis Sclat. (Black or Common Snowbird). Observed at Green Cove Spring.

Spizella socialis Bonap. (Chipping Sparrow). Common at Green Cove Spring and at Okahumkee.

Melospiza melodia Baird (Song Sparrow). Common on the St. John's.

Cardinalis Virginianus Bonap. (Cardinal Grosbeak). Very common all about the St. John's and Ocklawaha. Breeds.

Pipilo erythrophthalmus, var. Alleni Coues (White-eyed Chewink). Very common about the St. John's and Ocklawaha, also Okahumkee. Breeds.

Agelæus phœniceus Vieill. (Red-winged Blackbird). Common in the large marshes on the upper Ocklawaha. Breeds.

Sturnella magna Sw. (Meadow Lark). Common about Okahumkee.

Quiscalus major Vieill. (Boat tailed Grackle). Very numerous about the large savannas of the upper Ocklawaha. Several were seen on their nests from the boat.

Corvus ossifragus Wilson (Fish Crow). Common on the St. John's and Ocklawaha.

Cyanura cristata Swainson (Blue Jay). Common about the St. John's and at Okahumkee. Breeds. It differs very considerably from our northern blue jay in being much smaller and somewhat darker. The secondaries and tertials, instead of being "broadly tipped with white," are narrowly tipped with it and on some of the secondaries the white is scarcely perceptible: the white band on the tip of the tail is also much narrower and almost disappears on the fourth and fifth feathers. The black bands on the wings and tail are much narrower and on the tail are much less distinct and do not reach the shafts of the feathers. I will now give the comparative measurements of a Florida specimen and one from northern New York (Lewis Co.).

Locality.	*Date.*	*Age and Sex.*	*Length.*	*Extent.*	*Wing.*	*Tail.*
Leyden, New York.	Dec. 25, 1872.	♂ ad.	12·50	———	5·55	5·80
Okahumkee, Florida.	Apr. 18, 1873.	♂ ad.	10·50	15·50	4·90	4·76

As before stated I obtained four blue jays at Aiken, South Carolina. Three of them were nearly as large as our northern bird, and, in markings, resembled it more

than the Florida specimen. The fourth specimen, however, was marked much like the Florida one and its measurements are nearly the same; they are as follows:—length 10·75; extent 15·25; wing 4·90; tail 5·00.

Myiarchus crinitus Cab. (Great Crested Flycatcher). Very abundant at Green Cove Spring and at Okahumkee.

Ceryle alcyon Boie (Belted Kingfisher). Common on the St. John's.

Antrostomus Carolinensis Gould (Chuck-will's-widow). Common on the Ocklawaha and at Okahumkee. Breeds. Strictly a nocturnal species. Roosts on the ground during the daytime.

Chordeiles popetue Baird (Night-hawk). Very common about the St. John's and Ocklawaha. Breeds. Fifty or more often seen at once about the boat in the evening.

Trochilus colubris Linn. (Humming Bird). Very abundant at Okahumkee. Breeds.

Campephilus principalis Gray (Ivory-billed Woodpecker). Rare about the St. John's and Ocklawaha. Breeds.

Picus villosus, var. Audubuni ——. (Hairy Woodpecker). Abundant on the St. John's and Ocklawaha. Breeds.

Picus borealis Vieill. (Red-cockaded Woodpecker). Common at Green Cove Spring and at Okahumkee. Breeds. In habits, resembles *P. villosus*. Has a decided partiality for pine swamps and barrens.

Sphyrapicus varius Baird (Yellow-bellied Woodpecker). Common on the St. John's and Ocklawaha. Breeds.

Hylotomus pileatus Baird (Cock of the Woods). Very numerous about the St. John's and Ocklawaha. Breeds. Confined chiefly to the thick hummocks and swamps. Noisy bird.

Centurus Carolinus Bonap. (Red-bellied Woodpecker). Very common at Okahumkee. Breeds. Inhabits both the pine barrens and the swampy hummocks.

Melanerpes erythrocephalus Sw. (Red-headed Woodpecker). Common at Okahumkee. Breeds.

Colaptes auratus Sw. (Yellow-shafted Flicker; Yaffle). Common on the St. John's and at Okahumkee. Breeds. Differs perceptibly from our northern bird in being smaller and darker. Its dimensions are as follows:—wing 5·75; tail 4·30. The measurements of a specimen from northern New York (Leyden, Lewis Co.) are:—wing 6·50; tail 5·13.

Conurus Carolinensis Kuhl. (Parakeet). Common on the upper St. John's and on the Ocklawaha. Breeds. Gregarious. Roosts in hollow trees. Large flocks of them are often captured by finding a large hollow tree in which they roost and cutting it down after nightfall. They are very noisy birds and if a flock is anywhere in the neighborhood you are sure to hear them.

Strix pratincola Bonap. (Barn Owl). Common about the Ocklawaha. Breeds.

Syrnium nebulosum Gray (Barred Owl) Common on the lower Ocklawaha. Breeds.

Haliaëtus leucocephalus Savigny (Bald Eagle). One seen sailing over the St. John's. Breeds.

Pandion Carolinensis Bonap. (Osprey; Fish Hawk). Common about the St. John's and Ocklawaha. Breeds.

Hypotriorchis columbarius Gray (Pigeon Hawk). Not uncommon about the St. John's.

Tinnunculus sparverius Vieill. (Sparrow Hawk). Common on the St. John's and Ocklawaha. Breeds.

Buteo (borealis?) Vieill. (Red-tailed Hawk). Several *Buteos* were seen about the Ocklawaha, probably *B. borealis*.

Nauclerus forficatus Ridgway (Swallow-tailed Kite). Common about the St. John's and Ocklawaha. Breeds. The power of wing exhibited by this magnificent bird is truly wonderful. Its rapid flight and abrupt turnings can only be compared to those of the swallow. I have often seen them dart down and pick a wasp's nest from a leaf on the top of some high palmetto and fly off with it, devouring the grubs it contained while on the wing.

Cathartes aura Illig. (Turkey Buzzard). Common on St. John's & Ocklawaha. Breeds.

Cathartes atratus Lesson (Black Vulture). Very common on the St. John's and Ocklawaha. Breeds. Much more plentiful in Florida than *C. aura*. I have seen at once on a dead tree twenty-four of these birds and two turkey buzzards.

Zenædura Carolinensis Bonap. (Common Turtle Dove). Common about the St. John's and Ocklawaha. Breeds.

Chamæpeleia passerina Sw. (Ground Dove). This miniature Dove was quite common about the St. John's. Breeds.

Meleagris gallopavo Linn. (Wild Turkey). Common in the thick hummocks on the upper St. John's and Ocklawaha. Breeds.

Ortyx Virginianus, var. Floridanus Coues (Florida Quail). Common about the St. John's and at Okahumkee. Breeds.

Grus Canadensis Temm. (Sand-hill Crane). Common on the Ocklawaha.

Aramus giganteus Baird (Crying Bird; Limpkin). Common on the Ocklawaha. Breeds. Limpkins are very noisy birds; they would sit on a limb over the water and scold at us as the boat passed by. They were breeding and I noticed several females sitting on their nests as we passed; they were placed in the fork of some tree, or at the junction of some limb with the trunk, generally about eight feet above the ground (or water), and were constructed rudely of sticks, measuring externally about eighteen inches in diameter by ten deep.

Demiegretta Ludoviciana Baird (Louisiana Egret). Not uncommon on the Ocklawaha. Breeds.

Garzetta candidissima Bonap. (Snowy Egret). Common on the upper Ocklawaha. These beautiful birds were often seen in flocks of from ten to fifty, together with the white herons (*Herodius egretta*) and water turkeys (*Plotus anhinga*). They all breed together in the bushes that cover some parts of the large savannas, and construct rude nests of sticks.

Herodias egretta Gray (White Heron). Common on the upper Ocklawaha. Breeds.

Ardea herodias Linn. (Great Blue Heron). Common on St. John's and Ocklawaha. Breeds.

Florida cærulea Baird (Blue Heron). Common on the upper Ocklawaha. I obtained one nest of this bird at Okahumkee; it was built carelessly of sticks and was placed on some bushes about five feet above the ground. It was on a little floating island in a small pond, and contained two fresh eggs. The old birds were very shy and did not come within shooting distance.

Ardetta exilis Gray (Least Bittern). Common on the upper Ocklawaha. Breeds.

Botaurus lentiginosus Steph. (Bittern; Stake Driver). Common on upper Ocklawaha. Breeds. The natives call this bird "Scroggins."

Butorides virescens Bonap. (Green Heron). Common on upper Ocklawaha. Breeds.

Nyctiardea gardeni Baird (Night Heron). Common on upper Ocklawaha. Breeds.

Gallinula Martinica Lath. (Purple Gallinule). Common on the upper Ocklawaha. Breeds. These beautiful birds were very tame and would run about on the lily pads without showing any signs of fear as we approached and passed them. Natives call these birds "Blue Peters."

Fulica Americana Gmelin (Coot). Common on upper Ocklawaha. Breeds.

Plotus anhinga Linn. (Water Turkey; Snake Bird). Common on Ocklawaha. These curious birds, though unexcelled swimmers and divers, are generally observed perched on the top of some tall tree where their long necks can be seen for some distance. As the boat approached they would fly ahead and again alight in a similar situation. We sometimes saw them swimming in the water ahead of us and as the boat neared they would sink: they must be able to remain under water for a long time, for after diving I never saw one rise again. I obtained one of their nests at Okahumkee. It was built on the same floating island as that of the blue heron (*Florida cærulea*) before described. It was composed of sticks rudely laid together on the top of a bush, about eight feet high and contained four fresh eggs. I shot the female bird on the nest.

THE BOTANY OF THE CUYAMACA MOUNTAINS.

BY J. G. COOPER, M.D.

DURING the last week of April, 1872, I made a rapid but very delightful trip through a region scarcely known to naturalists, and of which the very name, as given above, is not, I believe, to be found on any published map.

Yet it is a range equal in extent and height to the White Mountains of New England, that favorite resort of eastern naturalists, which has furnished them with so many interesting subarctic species both of animals and plants.

The highest ridge of the Cuyamaca range lies forty miles east of San Diego Bay, being at the southwest corner of the Union, and thus almost the antipodes of the White Mountains: with which, however, we may compare it in many respects.* The summits of the three highest peaks are thus nearly as far from the coast as Mount Washington, and the central one, measured by my companion, Mr. W. A. Goodyear of the California Geological Survey, was found to be also about six thousand two hundred feet above the sea by mercurial barometer. The great mass of the range is granite, with some mica and talcose slate on its flanks, especially the eastern, where there are also gold mines, not long opened, but already paying well.

The foot-hills of the range commence about ten miles from the coast, some of them at once rising into rugged hills over one thousand feet high, and very conspicuous from contrast with the nearly level table-land (or "Mésa" of the Spanish-Americans), which extends from the sea inland, and often among the bases of the hills up to eight hundred feet elevation. This mésa is of very recent geological age, and has been lifted by successive stages so that it presents the appearance of more or less continuous terraces, at various intervals inland.

On the east side the descent is exceedingly rapid, from an elevation of four hundred feet a few miles east of the highest peaks, down to the Colorado Desert, which has lately been found by the

* The present article will show that on account of the scarcity of that one essential element, water, the southwestern range produces much fewer species than the northeastern.

railroad surveyors to be actually over two hundred feet below the level of the sea in its central parts. Looking off from the mountains in that direction, we see an immense, sandy level plain, bounded by distant rugged mountains toward the northeast, but illimitable toward the southeast, except by the dim misty horizon. Not a tree nor a trace of green vegetation relieves the eye, and we gladly turn away from it to the verdant hills above the summit of the wall from which we have been looking eastward.

The base of the range is therefore about fifty-five miles wide, with a slope of five thousand four hundred feet in thirty miles toward the west, and of the same amount in only fifteen miles on the east. It is singular that all the water falling *east* of the high peaks finds its way around them and runs to the *west*.

Vegetation. — Being thus the western rim of the desert, the dryest portion of the United States, where the rainfall (as measured at Fort Yuma) averages only about *two inches* annually, we may expect the mountains to partake, in some degree, of the sterility of the desert itself. But their vicinity to the Pacific Ocean, that exhaustless reservoir from which most of the rains of the western slope are derived, produces a fair amount of rainfall in winter, and at the same time increases the dryness of the desert, by intercepting this precipitation. At the same time the *summer* rains of Mexico and Arizona are to some extent poured out upon the eastern slope of the mountains between four thousand and six thousand feet elevation, thus failing to reach the coast, though they can be seen frequently from San Diego falling as thunder-storms upon the mountain tops, and very rarely pass over the lower passes northward to the Los Angeles plains.

Consequently the highest ridge is thickly clothed with trees, and although they end at four thousand feet on the east slope, they extend down the western, gradually thinning out, to the edges of the mésa, and thence along the banks of the rivers nearly to the sea. The lower mountains, and parts of the mésa are covered with shrubs but scarcely dense enough to hide the sterile rocks and gravel.

Near the sea, herbage of various kinds, but thin and of little value as pasture, covers the surface; improving, however, where ploughing has loosened the soil, packed almost to the hardness of bricks by two centuries of cattle-grazing and by the arid climate. A narrow belt of shrubby oaks (Adenostema and

Spiræa with some other shrubs), runs along within a mile of the beach, watered and sustained by the sea-fogs. Then comes what may be called the cactus zone, as six or eight species of that family, with low yuccas and other plants of the group bordering the desert are the most striking growth, often forming thickets by themselves in sandy places, and being in the dry season almost the only green vegetation. The laurel sumach (*Lithræa laurina* Nutt.) is a shrubby tree accompanying them in thickets of small extent.

These characterize the mésa, scarcely ascending above it, and form indeed the northern extension of the flora of the still more arid peninsula. The river-bottoms are more fertile, many grasses, flowering plants and small live-oaks (*Quercus agrifolia* Nees), sycamores and willows, lining the edges of the water-courses, which are, however, usually dry during nine months of the year, for a distance of five or six miles above their mouths. This valley vegetation consists chiefly of plants more common on the moist mountains, and in a great degree of species belonging to the northern instead of the southern (or lower) Californian flora. Some of the sandy portions, however, reproduce nearly the same group as the Colorado valley. Of course it is quite possible that isolated specimens of some trees may exist, not met with on our journey.

As the botanists of the Mexican Boundary, and Pacific R. R. Surveys have explored and thoroughly analyzed the flora of these lower zones, I will refer to their reports for further details.

The forests of the mountains may perhaps be best illustrated by giving an abstract of my observations made during our brief journey across them, at the same time giving an idea of the climate at the end of April.*

April 26th. At 1 P. M., we left town and rode over the mésa to the San Diego river, encamping a mile above the old Mission, where date palms and olives in cultivation give quite a tropical aspect to the already parched and barren scene. A few pools of stagnant water only remain in the wide sandy river-bed. I walked from camp three miles over the mésa north of the valley, to where it abuts against the granite hill through which the river has cut a deep narrow cañon, returning for two miles through the lower part

* In the tables of tree distribution in the Smithsonian Report, for 1858, I gave "San Diego Mountains" as the southwest range of many species not found there by me, having been wrongly informed as to their locality.

of this cañon. A little rivulet still runs down here, but sinks before reaching camp, and we had to obtain water from a well. Oak and sycamore (*Platanus racemosa* Nutt.) are here quite luxuriant close to the water but disappear below camp, and even willows become very small.* Remains of the ancient aqueduct, built by the Spanish missionaries full seventy years ago, to carry water from above this cañon nine miles to the mission, are very conspicuous, and show much engineering skill, as well as excellent workmanship.

April 27th. Mr. Goodyear and Mr. Fox of the Southern Pacific R. R., walked up the cañon to examine the geology and the aqueduct, finding an excellent dam, which has withstood nearly a century of summer droughts and winter torrents. I rode up the south mésa nine miles to Cajon valley, a basin lying between the mésa and the hills, in part the remnant of an old lake-bed excavated by the river before it broke through the hills. It now however looks very arid, the granitic gravel covering it being only thinly concealed by crops of wheat just ripening, and the surrounding native vegetation being all dried up. A few small elder trees (*Sambucus glauca*) are the only green things visible about a spring on the south side of the valley.

The river runs on the north side, six miles distant, and is there pretty well lined with the trees mentioned, together with some large cotton-wood poplars (*P. monilifera*). Its elevation being four hundred feet above the sea, and the impervious granite retaining the moisture, we find a great increase in tree growth compared with the lower region, but still confined to the moist river banks. The greater moisture is still further shown by the fact that although so arid, this is the first valley where a crop is successful this year, though it will mostly be cut for hay, which is so high priced at San Diego as to make it more profitable to cut it than to wait for the uncertain and light crop of wheat. Some other grain and vegetables are also raised along the river. The California wild grape (*Vitis Californica* Benth.) grows in moist spots about this valley. The green cornel (*Cornus pubescens* Nutt.) also forms a small tree along the streams.

About six miles east, the river again forms a cañon in which it never dries up and where the Indians have their favorite settlement, convenient to the acorn crop. The road, however, leaves

* Two or three species in these mountains grow sixty feet high and two in diameter, but I cannot name them.

this cañon on the north, ascending over rolling granitic hills, on which, at about six hundred feet altitude, we meet the first thick-cup oak (*Quercus crassipocula*), a curious form, with pale oval leaves, sometimes lobate, which remain green all winter down here, and fall on the coming out of the new leaves, now just grown. Various mountain plants, before unseen, accompany it, and it is perhaps the limit of the orange, which has been growing here for more than ten years successfully on Ames' ranche. The most notable shrubby trees are the northern evergreen plum (*Prunus ilicifolia* Nutt.), "wild lilac" (*Ceanothus thyrsiflorus* Esch.), and a shrubby live oak (*Q. Ransomi* Kell.).

Five miles from the valley at Flynn's, about nine hundred feet elevation, and in a narrow ravine, we first found a really luxuriant vegetation; the trees very large, crops heavy and a fine orchard, eight years old, of all the common fruits and some young orange-trees, figs, grapes, etc. The chief cause of this productiveness was forcibly impressed on our mind, by finding that the usual sea-fogs, which had been more dense than usual this day in the form of a cloudy sky, began to condense into rain after sunset, and heavy showers continued during the whole night. We afterwards learned that this rain was light in Cajon valley, but did not reach San Diego at all, though general in the northern part of the state.

April 28th. Light showers continued until 10 A. M., and as the clouds lifted, we saw the Cuyamaca Mountains, white with snow, only a few miles east of us. Crossing rocky and mostly barren granitic hills, which become more and more covered on their north slopes with large shrubs of northern species of Ceanothus, Arctostaphylus, etc., we reached another old lake bed called "Valle de los Viejos" (from some ancient aborigines found there by the first Mexican visitors), having an elevation of over two thousand feet, and where the verdure of spring was scarcely beginning to wither, but showed a paucity of species indicating that it is too cool for the southern desert forms and too dry at times for many of the northern.

From this we ascended a steep rocky ridge one thousand five hundred feet more, from the top of which we could look down on San Diego Bay, and distinguish the lighthouse plainly, to the southwest. Shrubs only cover this slope, but on crossing the summit, we immediately enter a scattered but luxuriant forest of live oak (*Q. agrifolia*). The scene reminded me strongly of the

similar growth on the mountains near Santa Cruz two hundred and eighty miles farther north, near the sea-level. Crossing a wide valley with a fine running stream, we ascended again and encamped at a height of three thousand eight hundred feet, about two hundred feet below the commencement of the pine growth. The two evergreen oaks here grow splendidly, scattered among grassy meadows fit only for grazing, on account of early frosts.

April 29th. There was heavy frost in the night forming thin ice at camp. Still gradually ascending through a lovely forest, alive with the songs of migrating spring birds, we found the yellow pine (*P. ponderosa* Dougl.) at a height of about four thousand feet, and a little higher the black oak (*Quercus Sonomensis*) just leafing out, a most beautiful reminder of the northern deciduous forests. Then comes the lofty and magnificent sugar pine (*P. Lambertiana* Dougl.), and near the summit of the dividing ridge, the graceful "white cedar" (*Libocedrus decurrens* Torr.), and a spruce which seemed, from the remnants of cones, to be the noble fir (*Picea nobilis* Dougl.), at about five thousand feet elevation, forming a tree three feet in diameter.

We have thus above the cactus zone, a zone of oaks from six hundred to four thousand feet, and then a zone of pines from four thousand to six thousand two hundred feet, but the former encroaches widely on the latter.

The road crosses this summit by an easy grade, close to the base of the highest peak, and a dense forest covers this and the other two next highest, which lie north and south of it. Circumstances prevented me from ascending the summit, very much to my regret, but I was informed by the gentlemen who did so, that the sugar pine and fir form the chief growth, with some oaks and Libocedrus and a less common pine with lower growth and spreading branches, but very large cones, apparently the *P. Sabiniana* Douglas, of the lower Sierra.

Frozen snow covered the branches of these trees for five hundred feet below the summit, making it dangerous for the travellers, from the chance of heavily encrusted branches or cones falling on them, but they made the trip safely, there being no wind, and the sun coming out so warmly, as soon to clear away the icy coating. The alder (*Alnus oblongifolius* Torr.) and sycamore continue up to five thousand feet on the west side of this ridge, but disappear on the eastern. Descending about five hundred feet to the Stonewall

mine, the country is varied with grassy meadows and hills covered with yellow pine and thick-cup oak, which here nearly altogether replaces the *Q. agrifolia*. It is also less forward in leafing than on the west slope where first seen, the old leaves almost all remaining. A low ridge east of this, and forming the summit of the steep descent to the desert, produces a scattered growth of the *P. Sabiniana* almost alone, just as it grows on the foot-hills bordering both sides of the San Joaquin valley, etc.

Among the herbaceous plants I recognized most as familiar northern species, and saw indications in their forms of a more arid climate than on the west slope at the same elevation. Our rapid journey and want of materials prevented me from obtaining a series of them, which would be interesting if only for the purposes of geographical botany.

April 30th. The road now going northward led us over the east base of the most northern peak, where I was much surprised at passing through one of the densest forests I have seen in California, for a distance of about five miles, consisting of the two live oaks and sugar pine, the former sometimes five to seven feet in diameter. The variety of *Q. agrifolia*, called *Q. oxyadera* by Torrey, is quite numerous from two thousand to four thousand feet altitude. What made it most surprising was that a few rods from its sharply defined eastern edge, is the rocky barren ridge forming the rim of the desert, and it seemed unaccountable how such a dense growth of trees could exist there. I was informed, however, by Mr. Fox that the "Sonora rains," as they are called here, are very frequent on this slope during summer, supplying the requisite moisture. He also told us that Pine valley, about fifteen miles southward, is the limit of pines in that direction, the mountains becoming so low near these as to intercept little moisture and to be consequently very arid. Such is their character along the line selected for the Southern Pacific R. R., and as far as can be seen in lower California.

The thick woods do not descend below about four thousand five hundred feet, where we came to a rolling hilly country, grassy and with scattered trees, chiefly on north slopes, of the oaks, yellow pine and *P. Sabiniana*, — extending to San Felipe Pass, at the summit of which are the most productive gold mines, and the rising village known as Julian City, four thousand feet elevation. The situation is beautiful at this season, but the whole of this

slope is too subject to the parching east or "Desert" winds to be of much value for any but mining purposes. From here the descent toward the northwest is very rapid, and pines end all at once; oaks, however, continuing on the north slopes and in moist spots. The *Quercus agrifolia* becomes again more common than the *Quercus crassipocula* which ceases at about six hundred feet. On the east slope it will be noticed that the zone of oaks is entirely wanting, or is mingled with that of pines, while the cactus zone immediately succeeds them.

Here the Cuyamaca range ends, being separated from other ranges to the north and northeast by the Pass and by Santa Isabel valley at the head of San Bernardo river. Its length, from this to the railroad pass near the Mexican Boundary, is thus about twenty-five miles, its width about the same, leaving out the low foot-hills on the west, and including only the portion above an elevation of two thousand feet. Descending into the valley, the sycamore reappears at about three thousand eight hundred feet, the cottonwood at three thousand five hundred feet, and the black oak disappears at the same elevation. The country is more cut up by wide valleys than on the slope we ascended, but they are generally drier at the same altitude. At our camp in a narrow valley, one thousand eight hundred and fifty feet high, trees were scarce, and crops grew only by irrigation.

May 1st. The road led over a rolling granitic ridge of hills between the San Bernardo and San Diego rivers, with scanty herbage and scattered oak groves, to the north side of Cajon valley, where we looked down from about one thousand feet elevation over this curious basin six hundred feet below us, and also over the terraced mésa toward the ocean, plainly perceiving San Clemente island eighty-five miles distant. The "Desert wind," which commenced yesterday, made the air unusually clear, but at the same time was so hot and dry as to be very uncomfortable. The Cuyamaca peaks appeared now to be completely bare of snow.

As the rest of the journey back was over the same route before described, I omit farther extracts from my journal. It must appear from these notes that this range, from its liability to severe droughts, does not have such a luxuriant flora and sylva as might be expected from its southern position, the trees being all merely straggliers from more northern forests, and none of them, except the yellow pine and oaks, found in great abundance. At the same

time the altitude of the central peaks, and the consequent coldness around their bases (snow falling on them as late as the middle of May some years), prevent the growth of the more southern group of trees and plants, which might find the moisture sufficient, above one thousand feet.

This is shown by the fact that in two isolated localities not far from this range, but in the low country, are small groves of trees probably belonging properly to the Sylva of the warmer high mountains of lower California. One of these is *Pinus Torreyana*, growing scantily on the sandstone bluffs near the mouth of Soledad creek, nine miles north of S. Diego Bay, and three hundred and fifty feet above the sea. The other is *Quercus oblongifolia*, found near the head of San Luis Rey river, sixteen miles north of Santa Isabel valley, and about one hundred and fifty feet altitude.* Besides these we miss on this range many northern trees found on the San Bernardino Range (eleven thousand six hundred feet high, by Mr. Goodyear's measurement). Of these I have noted the far-spread red fir (*Tsuga Douglasii*) and walnut (*Juglans rupestris* Englm.). The nut pine (*P. monophyllus* Torr.), and juniper (*J. occidentalis* Nutt.), of the great arid basin east of the mountains, very probably grow scantily lower down the eastern slope of this range.

SCIENCE IN THE UNITED STATES.

FROM THE FRENCH OF ALPHONSE DE CANDOLLE.

[THE following extract is taken from a recent publication, entitled "Histoire des Sciences et des Savants depuis deux siècles" — a very curious and instructive work, in which the lists of foreign associates and correspondents of the three leading scientific academies (those of Paris, London and Berlin) have been scrutinized with elaborate care and subjected to a most searching analysis. The passage which we have translated is a section upon the United States, contained in a detailed "examination of different countries viewed with regard to the causes of their influence on the sciences." It is difficult fully to appreciate the

* I am inclined to believe this to be only a very luxuriant growth of *Q. crassipocula*, but have not seen the acorns.

argument which runs through this extract, without presenting such an analysis of the whole work as would occupy too much space. We commend the entire volume to the careful study of the readers of the NATURALIST, as an admirable example of a scientific essay. — S. H. SCUDDER.]

The two foreign associates of the French Academy, and the majority of the American correspondents of this Academy and of the two other bodies above mentioned,* belong to the New England states. Consequently, calculations based on the Union taken as a whole do not give correct ideas, and, to appreciate the influences at work, we must distinguish between the six northeastern states and the rest of the country.

The most brilliant epoch for New England was that of Franklin and Rumford. The population of this part of the United States was at that time only half a million, and in consequence of its origin it presented very favorable conditions.

The only unfavorable conditions were our Nos. 1, 2, 7 and 18.† None of these are very important or very characteristic. We thus understand why New England has made the same progress in science as the most civilized countries of Europe. The early pilgrims resembled the protestants expelled from France and Belgium, in their ancient intellectual culture, their devotion to ideas rather than to interests, their laborious and austere life.

The rigor of the old Calvinism gave place at Boston, as at Geneva and in Scotland, to broader and more tolerant ideas. Without this a Franklin would not have been possible, and the scientific influence of Harvard University can scarcely be otherwise explained. If, to-day, anything would seem to threaten this select population of New England, it is the incessant emigration of its youth to other parts of America and the immigration of foreigners for the most part very different from the early settlers. Perhaps also the characteristic activity of Americans is an obsta-

* The Royal Society of London and the Academy of Sciences of Berlin.

† These are given on a previous page, as follows:

1. Small proportion of persons belonging to the rich classes, as compared with those who are obliged to work for their living and especially to labor with their hands.

2. Small proportion among the richer classes of those who are contented with their income and whose property requires but little attention, so that they are inclined to devote themselves to intellectual pursuits by no means lucrative.

7. Insufficient and poorly organized material for various scientific work, such as libraries, observatories, laboratories and museums.

18. Distance from civilized countries.

cle to the cultivation of the sciences, even in the New England states. Taking the Union as a whole, the principal difficulty evidently lies here. The young men abandon their studies early in life. They change their residence and profession again and again, hoping for greater and more speedy gains. *Savants* whose learning does not extend to trade stand strangely alone in a society thus devoted to the production of all mercantile commodities. The inventive genius of Americans also gives the preference to applications which do not strictly belong to science. I need only repeat here what a very distinguished American *savant* said recently at the opening of a session of the scientific association of the United States.* Moreover, to be just, and to reply to certain European notions founded on a superficial knowledge of the people of the United States, it will be well to add one remark. It is not through greed of gain and of material pleasure that the Americans throw themselves with such ardor into lucrative pursuits. They are quite capable of sacrificing their interests to ideas, as we have seen in their great civil war. It was surely for the interest of both parties that they should then, by means of mutual concessions, continue to live in peace; but the south held to the original sovereignty of each state, the north to the present and future aggrandizement of the United States, and a portion of the people aimed at the abolition of slavery. They sacrificed everything to sentiments and ideas. When a few hundred men can be found among the Americans, as zealous for the advancement of science as their volunteers were for political opinions, they will make marvellous progress. It is not activity nor intelligence which they lack: it is the will to apply themselves to that which brings in no return, and which is not in sympathy with the popular taste.

* "True, it has already given to the world many a master work, in the arts of peace and the arts of war; the steamboat, the cotton gin and the sewing machine; the practical application of the electric telegraph, and the means of its printed record; the most perfect form yet attained for the steam engine and the steam boiler; the most powerful ordnance and the most impregnable vessels; the telescopes of Clark and Fitz, the microscopes of Spencer and Tolles, and the means of annihilating pain. . . . . But what I would now say is, that, whatever may be the claims of our country to have done her part in the furtherance of civilization so far as depends upon the solution of high political problems and upon advancement in the arts, her contributions to science have not kept pace with these; nor, indeed, with those of several European nations which have had to contend against obstacles quite comparable in magnitude with our own, even though of a totally different nature." Address of ex-president B. A. Gould in 1869. [This extract is from the original. DeCandolle quotes from an incomplete translation which appeared in the Gazette Médicale de Paris, May 20, 1871. The address was delivered in 1869, not in 1870, as stated by DeCandolle.]

It would seem also that in this young nation (excepting New England) the people are of a very speculative turn of mind. Poets of both sexes are numerous. Religious sects sometimes give evidence of a great power of imagination. The most eccentric, that of the Mormons, strove to reëstablish a well known institution, polygamy, but it has also invented the theory of spiritual wives, which, by its purity, its grace and its novelty, really deserves a prize of poesy. Spiritualism has found more favor in the United States than in Europe. Now to reach a brilliant scientific epoch, we must have a public eager for abstract truth, for things which may be demonstrated by perfectly sure processes, and, I should add, things of little or no practical use.

Precedents, traditions, so advantageous to free scientific labor, are wholly wanting among most of those who emigrate to the United States. The selection of this population is brought about by a desire for lucrative employment, and the result is in perfect accordance with the theory. It would be quite different, if, for example, wars and revolutions were gradually undermining civilization in Europe, and if thousands of families who had followed liberal professions for one or two centuries, hoped to find more security in America. We should then see, on a large scale, what took place for the benefit of New England, of Switzerland, of Holland and of Prussia, at the time of the old persecutions of French and Belgian protestants. America would have inherited the secular culture of sciences in Europe. In the absence of similar circumstances, the extension of inherited fortunes, of instruction, and of the isolation, already apparent, of many enlightened men in the midst of democratic tumult, must gradually develop, among a certain class of the American people, a taste for disinterested and purely scientific research.

Distance from the old civilized countries has long been injurious to the labors and the reputation of American *savants*. In proof of this, we may notice that the only citizens of the United States called to the high distinction of the title of Associate of the French Academy of Science, Franklin and Thompson, Count Rumford, had resided in Europe, the first in a conspicuous position, the other for a long period of years.* Otherwise, it is very

* DeCandolle's tables end with 1870. Since then the late Professor Agassiz was elected a Foreign Associate, though DeCandolle would have probably classed him with Swiss scientists, as not having been born and educated in America.—EDS.

possible that less attention would have been paid to their labors. In our day, communication has become more ready. Many young Americans study in Europe. Others come to travel after publishing memoirs. Their scientific zeal is thus increased, and the European *savants* become better acquainted with them. Finally, the Anglo-American language is destined, by the force of circumstances, to predominate. In every way, therefore, one may expect a larger development of the sciences in the United States—it is true in a somewhat distant future, for favorable influences make themselves felt only after one or two generations.

BOTANICAL OBSERVATIONS IN WESTERN WYOMING.

BY DR. C. C. PARRY.

No. 2.

Wind River, which in pursuing a general southeast course drains the entire eastern slope of the Wind River range, also receives from the east and north the drainage of an extensive mountain district, to which, as a whole, no distinctive name has yet been applied. To the most southeastern extension of this mountain system the name of Owl Creek range has been locally applied. At the lowest point, where this merges into the open and elevated plains, the main stream, turning sharply to the north, loses the name of Wind River to assume that of the Big Horn, tributary to the Lower Yellowstone. Thus it happens that the same stream, under another name, in doubling on its upper course from southeast to north, receives lower down the eastern drainage of the Owl Creek range, and the broken mountain district to the northwest, through the little known Big Horn tributaries of Owl Creek, Gray Bull and Stinking Water.

Our route, instead of following down the main valley, crossed Wind River some distance above the sharp bend above referred to, thence crossing a low spur of the Owl Creek range, and skirting near the base of the high mountains to the west, passed Owl Creek, Gray Bull and several southern tributaries of Stinking Water, to ascend a main branch of the latter stream to its source

in the high divide separating its waters from those of the Yellowstone basin. On this route the chief point of botanical interest centred in the comparatively little explored district of Owl Creek range, the valleys of Owl Creek, Gray Bull and Stinking Water, and the high mountain region at the sources of the last named stream. We accordingly note briefly in their order of passing the features of botanical interest presented on our route.

The valley of Wind River, as its name suggestively implies, is especially subject to the sweep of fierce northwest winds, which necessarily leave their impress upon the native vegetation. Thus everywhere on the uplands and low open valleys there is a close uniform growth of stunted grasses, or the dull moorish aspect presented by the constantly recurring Artemisia. On saline flats the view is hardly improved by a ranker and more verdant growth of the spine-clad *Sarcobatus;* everywhere there is a monotonous recurrence of the same forms of vegetation, comprising such only as are capable of withstanding the combined unfavorable influences of a parched soil during the season of summer growth, followed by an early and rigorous winter. Only in moist, sheltered bottom-lands do we meet with anything like a rank vegetation, made up of dense willow thickets, occasional copses of *Shepherdia argentea* Nutt., with irregular scattering groves of *Populus balsamea*. Especially abundant in all damp, rich, alluvial tracts in this region we meet with the "wild licorice" (*Glycyrrhiza lepidota* Nutt.), here very commonly infested with a parasitic fungus, *Trichobasis leguminosarum* Link.

In the series of steep bluffs bounding the main river bottoms, the deep gullied ravines offer a greater variety of soil and exposure favorable to a diversified and peculiar vegetation. Here, accordingly, among other rarities we meet with a well marked new species of Astragalus, distinguished by its loose straggling habit, growing in light loamy soil, and sending up a loose spike of white flowers which rarely mature fruit. Prof. Gray has characterized this species (No. 65 of the distributed collection) as *A. ventorum*, n. sp. (see appendix). Here also along the slopes of high gypseous ridges we meet quite abundantly with a new composite, *Schkuhria* (*Platyschkuhria*) *integrifolia* Gray, n. sp. (see appendix, No. 150); of a habit and foliage quite unlike any other species of this genus.

On reaching the broken foot-hills of the Owl Creek range, both

the scenery and vegetation became much more diversified; and rounded slopes of disintegrated metamorphic rocks, sharp crests of upheaved strata, and extensive exposures of the brick-red Triassic formation, present in their varied exposures all the conditions for a varied flora. We accordingly here meet with such choice plants as *Stanleya viridiflora* Nutt., *Oxytropis campestris* L., var.? (No. 88), *Aplopappus multicaulis* Nutt., *Tanacetum capitatum* Nutt.

Farther up on the mountain slopes the increased elevation is evidenced by greater freshness of vegetation, the dull brown of the lowlands giving place to a rich soft verdure. Constant running streams, however, are still rare, as the altitude is not sufficient to afford heavy deposits of winter snow to keep up a supply of water through the dry summer months. As we again encounter pine woods composed mainly of *Abies Douglasii* and *Pinus flexilis*, the associated undergrowth is again brought to view in thick, matted growths of *Arctostaphylos uva-ursi*, and occasional patches of *Berberis Aquifolium*. Still there is a characteristic absence of many forms such as one would naturally look for in such localities, neither scrub oak, Rubus nor Symphoricarpus being here represented. Very common and attractive over all this district are the bright, showy flowers of a species of Lupinus (No. 54) allied to *L. sericeus* Ph.? but difficult to refer to any described species; here also *Hedysarum boreale* Nutt. is conspicuous, with its slender spikes of nodding pink flowers, occasionally inclining to a dull pinkish-white. On the crests of the dividing ridge attaining an elevation of nine thousand feet there are extensive exposures of an arenaceous limestone, presenting tabled summits and perpendicular mural faces, with irregular broken talus at their bases. These localities offer not only very attractive points of view of the adjoining country, but afford a rare field for the botanist. Here in rock crevices was found the charming dwarf columbine, which, in compliment to the enterprising commander of the expedition, and its first actual discoverer, I have named *Aquilegia Jonesii*, n. sp. (see appendix, No. 3). This species, which is most nearly allied to *A. vulgaris* L., is sufficiently distinguished by its dwarf size and close cæspitose habit, as well as other well marked characters indicated in the description referred to. It would no doubt prove highly ornamental in cultivation, but unfortunately at the period of our collection (in July) the fruit was just maturing,

and it was only by diligent search that sufficient late flowering specimens were met with to complete the description.

Besides this choice addition to our native flora, other plants worthy of note may be enumerated, viz: *Anemone multifida* DC., *Arenaria arctica* Stev., *Arenaria Rossii* R. Br., *Lupinus minimus* Dougl., *Oxytropis campestris* L., *Spiræa cæspitosa* Nutt., *Saxifraga Jamesii* Torr., *Saxifraga debilis* Engel., *Phlox Douglasii* Hook., *Polemonium confertum* Gray, *Androsace chamæjasme* L., *Castilleia pallida* Kth., *Lloydia serotina* Reich.

The peculiarities of the timber growth in this section will be more fully dwelt on in a subsequent article; it is sufficient here to note the regular order of succession everywhere noticeable as distinct zones of arborescent growth. Thus the lower mountain slopes are occupied by scattered groves of *Pinus ponderosa* and *Abies Douglasii*, succeeded higher up by *Pinus flexilis* and *Pinus contorta*, while the highest ridges support a dense forest of *Abies Engelmanni*.

In descending the northeastern slope of the Owl Creek range, forming the western edge of the Big Horn basin, we come upon principal tributary streams draining the high mountain region to the west. In all these valleys, including Owl Creek, Gray Bull and Stinking Water, a uniform character of vegetation is observable, constituting a very distinct botanical district. On the steep gravelly ridges bounding the valley of Owl Creek was first noticed a very remarkable species of *Stanleya*, distinguished from all other known species of this interesting genus by the dense tomentose covering of its stem and foliage, and the sharply hastate form of its leaves. I have accordingly named it *Stanleya tomentosa*, n. sp. (see appendix, No. 13). This plant, then (July 20), in the full glory of its dense spike of cream-colored flowers, formed a conspicuous feature in the floral landscape. In this same locality was also found a new species of *Phelipæa*, which on account of its bright yellow color I have named *Phelipæa lutea*, n. sp. (see appendix, No. 202). This plant, which is met with growing in close proximity to the allied species, *Phelipæa fasciculata* Nutt., furnished an opportunity for a direct comparison of fresh living specimens, thus affording a more satisfactory means of distinguishing specific difference than could be derived from the dry faded plants. Along the borders of a dry ravine was collected a yellow flowered *Astragalus* with nearly mature fruit. This, on a cursory view, I

noted as a form of *A. flavus* Nutt., previously collected on Green River. Prof. Gray, to whom specimens were sent under the above name, recognized its distinct character. I have therefore ventured to compliment the *actual* discoverer, as well as the chief elucidator of this difficult genus of western North American plants, by naming it *Astragalus Grayi*, n. sp. (see appendix). A side trip by a detached topographical party to the rugged peak named by Capt. Jones "Washakee's Needles" revealed, in a few fragments brought back by the party, a more distinct alpine flora than any yet seen, including *Douglasia montana* Gray, and a most singular depressed *Townsendia*, with its large single heads immersed in a globular mass of lanulose coated leaves. This, as far as the imperfect material affords the means of judging, is probably an undescribed species, to which the name of *Townsendia condensata*, n. sp., may be provisionally applied. In the lower mountain ranges there is a succession of charming subalpine meadows, set off with limpid lakes and traversed by clear ice-cold brooks, which, among other well known plants, furnished the following additions to our list, viz: *Astragalus oroboides* Hornem., *Œnothera breviflora* Torr. and Gray, *Aplopappus inuloides* Torr. and Gray, *Artemisia incompta* Nutt., and the singularly neat European species *Myosotis alpestris* L. In the valley of Stinking Water (a most inappropriate name for a clear mountain stream abounding in the finest trout), at a single locality, was collected the rare Chenopodiaceous plant characterized by Dr. Torrey as *Endolepis Suckleyi* Torr. This, in the unpublished revision of this family by Mr. S. Watson, is to be included in the genus *Atriplex* (*A. Endolepis* Watson, ined.). The excellent figure of this plant in Vol. xii, pl. 3, of "Pacific Railroad Reports," only fails to represent the straggling habit, densely divaricate branches and the blistered, mealy-dusted leaves of this species. It seems to affect a peculiar soil, so strongly impregnated with saline ingredients as to be entirely bare of all other vegetation.

In our course up the valley of Stinking Water there was little of botanical interest to attract the attention. The prevalent rocks were composed of a coarse igneous conglomerate, which weathered into the most fantastic shapes, presenting on either hand sharp pinnacles, toppling columns and chimney peaks; but the uniformity of soil derived from its disintegration was unfavorable to a rich development of floral forms. We accordingly note briefly the

following as most abundant and characteristic: *Arenaria pungens* Nutt., var. *Astragalus microcystis* Gray, *Heuchera cylindrica* Dougl., *Bahia leucophylla* DC., *Stephanomeria paniculata* Nutt.

On reaching the upper portion of this valley, becoming more densely wooded, and frequently spreading out into open, grassy parks, a much more attractive and varied flora is brought to view. The pine woods, composed almost exclusively of *Pinus contorta*, with scattering trees of *Abies grandis*, and in the drier mountain slopes of *Abies Douglasii*, overshadow thick moss-bedded festoons of *Linnæa borealis*, associated with *Pyrola minor* L., and occasionally the more peculiar western form of *Pyrola dentata* Hook. Here too occurs abundantly *Antennaria racemosa* Hook., with sterile and fertile plants growing in distinct plots; scanty specimens were also collected of what is probably the little known *Antennaria luzuloides* Torr. and Gray. Everywhere on the moist, wooded slopes is a thick undergrowth of *Vaccinium myrtilloides* Mx. Rhamnus is represented by the well known northern form of *Rhamnus alnifolius* L. Her., and on the margins of ice-cold springs we meet with *Mimulus moschatus* Dougl. In ascending the higher mountain peaks, the rocky crags are brilliantly adorned with clumps of *Pentstemon deustus* Dougl., or the more showy *Pentstemon Menziesii* Hook. Along the borders of alpine brooks, together with the wide-spread *Mertensia Sibirica* Dougl., we meet with the showy *Mimulus Lewisii* Ph., so interesting in its association with the early explorer Lewis. *Mitella trifida* Gray is here found associated with the more common *Mitella pentandra* Hook. In similar localities, strangely remote from their original habitat, we meet with *Zauschneria Californica* Presl and *Kellogia galioides* Torr.! Near the bald alpine summits, where the ground is saturated from the recent melting of snow-drifts, grows the "California heath," *Bryanthus empetriformis* Gray, and here also at the most eastern locality yet noted was found a dwarf form of *Spragnea umbellata* Torr. The occurrence of so many peculiar Californian forms in such an isolated locality on the Atlantic slope is very suggestive.

On the high alpine crest at the head of Stinking Water, overlooking to the west the Yellowstone basin and its magnificent lake, a more alpine flora is exhibited, though composed mainly of dwarfed forms of plants met with lower down, as may be seen from the following list, noted down August 2, viz: *Arabis Drum-*

mondii Gray, *Arabis canescens* Nutt., *Draba alpina* L., *Smelowskia calycina* C. A. Mey., *Arenaria arctica* Stev., *Ivesia Gordoni* Torr. and Gray, *Potentilla dissecta* Pursh, *Astragalus alpinus* L., *Astragalus Kentrophyta* Gray, *Lupinus minimus* Dougl., *Sedum stenopetalum* Ph., *Townsendia* (not determined as to species. No. 145), *Erigeron compositum* Ph., *Senecio canus* Hook., *Achillea millefolium* L., *Phlox Douglasii* Hook., *Polemonium humile* var. (*P. parvifolium* Nutt.), *Mertensia alpina* Dougl., *Myosotis alpestris* L., *Eriogonum ovalifolium* Nutt.

In a concluding article, the general botanical features of Yellowstone Park and the head waters of Snake and Wind Rivers will be considered.

NOTE.—In order to render the determination of the new species mentioned in this and the preceding paper as complete as possible, and most convenient for reference, the descriptions will be given as an appendix to the concluding article.

NOTES UPON AMERICAN WATER BIRDS.

BY ROBERT RIDGWAY.

THE following are a few points which have been developed by our studies of the water birds in connection with the forthcoming "History of North American Birds," by Professor Baird, Dr. Brewer and the writer. They are published in advance of our work, that ornithologists may thus the sooner have the benefit of them.

In making a comparative study of the North American and European Grallæ, I have been struck by a very curious parallelism between certain congeneric or conspecific forms of the two continents. In many cases, the European analogues differ from their North American representatives chiefly, if not exclusively, in having the rump immaculate white, instead of spotted. The following table will show the extent of this parallelism, so far as I have had occasion to trace it.

American forms (rump spotted).	*European forms (rump immaculate).*
Rhyacophilus solitarius.	R. ochropus.
Gambetta flavipes.	G. stagnatilis.
Numenius Hudsonicus.	N. phæopus.
Hæmatopus palliatus.	H. ostralegus.

Ægialitis microrhynchus Ridgway. N. SP. Winter plumage similar to that of *Æ. semipalmatus*, but the cheeks white up to the eye, the white of the forehead less distinctly defined, grading insensibly into the gray posteriorly, and anteriorly reaching to the bill. Two outer tail feathers white, with a blackish transverse spot across the inner web. Much more slender than *Æ. semipalmatus*, and the bill of entirely different form, being short and exceedingly attenuated. Wing, 4·35; tail, 2·50; culmen, ·50; depth of bill, ·10; tarsus, 1·00; middle toe, ·65. Type, No. 39,523, Nat. Mus., San Francisco, Cal.; E. F. Lorquin.

Ægialitis melodus, var. *circumcinctus* Ridgway. Breeding plumage similar to var. *melodus*, but the black pectoral band complete across the jugulum, instead of being interrupted in the middle portion. Wing, 4·60; tail, 2·30; culmen, ·50; tarsus, ·85; middle toe, ·55. Type, No. 9,035, ♂ ad., Nat. Mus., Loup Fork of the Platte, July 8; Dr. F. V. Hayden. Length, 6½; extent, 14¼. *Habitat.* Plains between the Missouri River and Rocky Mountains.

The restricted var. *melodus* is found only in the Atlantic States.

Ægialitis Wilsonius, var. *rufinucha* Ridgway. Similar in color to var. *Wilsonianus*, but the tints much darker; sub-orbital region dusky, instead of whitish; occiput of the male deeply rufous: frontal white band narrower than the black one behind it. Wing, 4·50; tail, 2·25; culmen, ·80; tarsus, 1·20; middle toe, ·70. Type, No. 30,319, ♂, April, 1863, and 26,853, ♀, Dec. 20, 1861, Spanishtown, Jamaica; W. T. March. *Habitat.* Jamaica.

Ægialitis cantianus Lath., var. *nivosus* Cassin. (*Ægialitis cantianus* Coues, Key, p. 245.) This bird is distinguishable from the European form by the lores being destitute of a black stripe, instead of having a quite conspicuous one.

Ægialitis montanus Towns. (*Ægialitis Asiaticus* var. *montanus* Coues, Key, p. 245.) This species proves to be very distinct from that of Asia, to which Dr. Coues referred it on the authority of Schlegel. He has since informed us, after examination of specimens in the breeding plumage, that he is satisfied of the specific distinctions, our species having no pectoral black belt.

Ægialitis hiaticula Linn., var. *semipalmatus* Bonap. The American bird differs from the European merely in lacking the white post-ocular space in narrower pectoral band, and in its slightly smaller size.

Gallinago acolopacina Bonap., var. *Wilsonii* Bonap. The American form of this species is distinguishable from the European merely by slight differences in proportion, being smaller in general measurements, especially in length of bill and tarsus, with comparatively longer wing.

The *G. nobilis* Scl. and Salv., of northern South America, *G. Paraguæ* Vieill., of the southern portion of the same continent, and *G. Australis* Lath. of Australia, seem to be also referrible to the same species, though slightly distinguished by the attenuation of the outer tail feathers, thereby showing an approach to *G. stenura* Kuhl, of the Malayan region, which, however, has twenty-six, instead of fourteen to eighteen rectrices.

Limosa rufa Temm., var. *uropygialis* Gould. The differences between this race and that of Europe are very slight. The Alaskan bird is merely paler colored on the lower surface, and has the axillars and rump with dusky prevailing, instead of mostly white.

Ibis falcinellus (Linn.). (*Ibis Ordii* Bonap. et Auct.) The glossy Ibis of the West Indies and the eastern United States is absolutely indistinguishable from that of Europe. A close examination of nearly a hundred American specimens, reveals the fact that this continent contains at least one, and probably two, species distinct from the *I. falcinellus* or *I.* "*Ordii*."

The three species found in America may be distinguished as follows: —

A. Adult with the head, neck and lower parts chestnut. Young with these parts streaked white and grayish dusky, the metallic reflections of the upper parts with varying lights of purple, violet and green, the lesser wing coverts with a patch of chestnut.

  a. Head dusky around the base of the bill, which is dull greenish in the adult. *Habitat.* Old World, West Indies, and Eastern U. S. 1. *I. falcinellus.*

  b. Head white all around the base of the bill, which is dusky red in the adult. *Habitat.* Whole of tropical America, and middle province of U. S., from Chili and Buenos Ayres to the Columbia river. 2. *I. guarauna.*

B. Adult with the head and lower parts as in the young of the preceding species; the metallic reflections of the upper parts of a uniform shade of vivid bronzed green; lesser coverts without a chestnut patch. *Habitat.* Pacific coast of America, from California to Chili; western portion of the Great Basin (Humboldt river, Ridgway). 3. *I. thalassinus.*

Other characters of as great importance accompany the above, while their constancy is shown by large series of each species. The chief synonymy of these species stands as follows: —

1. *Tantalus falcinellus* Linn., S. N. I., 241. (*Ibis Ordii* Bonap., List, 1838. Baird, B. N. Am., 1858, p. 685. In part only!)

2. *Scolopax guarauna* Linn., S. N. I., 242. (*Tantalus chalcopterus* Temm. pl. col. "*Ibis Ordii* Bonap.," Baird, B. N. Am., 1858, p. 685. ??? *Tantalus Mexicanus* Gmel., S. N. I., 1788, 652.)

3. *Ibis guarauna* Baird, B. N. Am., 1858, pl. lxxxvii. Id. Catal. N. Am. B., No. 500*a*. *Ibis thalassinus* Ridgway, Rep. U. S. Geol. Expl. 40th par. (In press.)

Rallus elegans, var. *obsoletus*, Ridgway. Differing from var. *elegans* in being more grayish above, where the stripes are nearly obsolete, and dark brown, instead of deep black on a yellowish olive ground. Rufous of the lower parts paler and duller. Wing, 6·30; tail, 3·50; culmen, 2·25; bill, ·50 deep at base; tarsus, 2·10; middle toe, 2·00. Type, 6,444, San Francisco, Cal., March, 1857; Dr. Suckley. *Habitat*. Coast of California.

Rallus elegans var. *tenuirostris* Lawrence. Similar in colors to var. *elegans*, but smaller, and with very much slenderer bill. Wing, 5·90; tail, 3·25; culmen, 2·00; bill, ·35, deep at base; tarsus, 1·80; middle toe, 1·70 (No. 52,849, Valley of Mexico; Col. A. J. Grayson). Type, from city of Mexico, in cabinet of Mr. Lawrence.

Porzana Jamaicensis, var. *coturniculus* Baird. Differing from var. *Jamaicensis* of southeastern United States, West Indies and South America, in smaller size, and more uniform colors. Back without white specks. Wing, 2·50; culmen, ·52; bill, ·15 deep at base; tarsus, ·80; middle toe, ·80. Type, No. 12,862 Nat. Mus., Farallone Islands, coast of California; T. G. Martin. *Habitat*. Farallone Islands, California.

Anas obscura, var. *fulvigula* Ridgway. Differing from var. *obscura* in lighter and much less uniform colors, and unstreaked deep buff throat. Deep ochraceous borders to the feathers very broad, on the lower surface almost as wide as the dusky medial streaks. Wing, 10·30; tail, 5·00; culmen, 2·05; width of the bill, ·90; tarsus, 1·70; middle toe, 1·90. Bill olive color (olive-yellow in life?); feet, deep orange-red. Type, No. 1,748, Mus. R. Ridgway, St. John's river, Florida. C. J. Maynard. *Habitat*. Florida; permanent resident.

A specimen in the National Museum (No. 61,360) from the St. John's River, collected by Mr. G. A. Boardman, is exactly similar.

NOTES FROM THE JOURNAL OF A BOTANIST IN EUROPE.

BY W. G. FARLOW, M.D.

PART II. NORWAY, ETC.

I LANDED at Christiania upon a high holiday, one rather striking to a pilgrim from the new world. The people were celebrating the two thousandth birth-day of Norway! I found Professor Schübeler at home; and the next day he showed me through the Botanic Garden and the University. Although the Garden is poor enough compared with that of Lund, yet it is good considering the latitude, and the conservatories appeared to be as large and as well filled as those at Cambridge. The university buildings are well situated, and I should think more extensive than those at Cambridge. The Professor is a man of boundless energy, and is making the most of narrow means and a poor climate. He gave me a list, by no means a long one, of all the American trees in the garden. It would be an easy and excellent thing for an American correspondent to double and triple their number. Seeds and cones are desired rather than young plants, for obvious reasons. There is the same confusion in the north of Europe of our two spruces as that which prevails, or till lately prevailed, in the nurseries and plantations at home. The plantation of "*Abies alba*" which Professor Agardh showed me at Lund was mostly in fruit, and every tree of it *A. nigra;* while here, Prof. Schübeler's only tree of "*Abies nigra*," also in fruit, proved to be *Abies alba*. The herbarium here is of no special consequence.

What most interested me, besides a few algæ given me from Lyngbye's collection, valuable as souvenirs, was a museum of the economical products of Norway, especially the grains, entirely prepared by the present Professor; and a very interesting chart made by him of the arable lands of Norway. The cultivable grounds appeared as mere lines, almost as narrow as the rivers on a map. As I subsequently found, fully nine-tenths of the country consists of steep rocky mountains, and only the banks of the rivers are fertile. The perseverance of the people is wonderful. Every spot at all level is closely cultivated. Tracts of half or a quarter

of an acre, up on the sides of the mountains, are covered with barley; and available spots on the fiords, accessible only by some miles of hard rowing, are planted with oats. The grain is stacked in little heaps in the fields and a sort of rail fence is made to which the hay is fastened to dry. In many places the hay has to be carried down the mountains on the peasants' backs. I can't imagine how they get hay enough to keep their cattle through the winter. Southern Norway, moreover, is more like New England than any country I have seen, only more mountainous. The houses are wooden and painted white, and there are rail fences. Cherries and a very few apples are the only fruits. The wild strawberries are delicious, but the natives prefer the molteberry which is quite insipid. It flourishes high up in the mountains where only *Salix glauca* and *Betula nana* grow. I was surprised to find that the *Abies excelsa*, or Norway spruce, is not a mountain tree. It is not a handsome tree till you reach the valleys of southern Norway. *Pinus sylvestris* grows alone on the higher mountains and is far from beautiful. The poverty of the forests in species is striking; nothing but birches, alders, and one or two conifers.

The herbaceous plants were more varied, and very attractive to me; possibly the more so because I had to puzzle them out with the only book I had, Hartmann's Flora in Swedish, which I can't read, but could guess at the botanical terms. Fortunately at the top of the Fille-field I met a botanist who spoke a little German. *Erica tetralix* is to me the most beautiful plant in Norway. *Digitalis purpurea* here grows on the edge of the glaciers and *Gentiana nivalis* by the roadside. *Aconitum septentrionale* abounds everywhere. I was surprised to find that the hood of every flower, in a hundred or more I examined, had been perforated by some insect, which in this way sought the honey.

I hoped to find some good algæ, especially at Molde, but was unsuccessful. After two days' contemplation of *Fucus nodosus* and *vesiculosus* in various forms, I passed on to Bergen, the rainiest town in Norway and, I believe, in the world. There the water is warmest when the wind is north, owing to the Gulf Stream, and, whichever way the wind blows, the odors are horrible.

As to the scenery, it is always pleasant, sometimes very grand. The Romsdal is a very wild and gloomy pass about twenty miles long, and perfectly dripping with lovely waterfalls and cascades.

The peaks are sharper than anywhere else and covered with snow. The view of the Romsdal mountains from Molde is the finest distant view I saw in Norway, where distant views are scarce owing to the narrowness of the valleys. From Bergen, I went up the Hardanger Fiord and into the Sör Fiord to Odde. The fiords are the finest things in Norway, mountains two or three thousand feet high, sometimes more, coming straight down into the greenest of water. You sail on for hundreds of miles, the scenery varying from grand to grander. The Sör Fiord is particularly fine, the water is narrow and the mountains black and steep, with the Folgefond glacier on one side hanging over the cliffs, and coming down the ravines. From Odde I visited the Skaggindal foss, a pretty waterfall pouring into a beautiful lake; and a glacier in the vicinity, the first I had ever seen close at hand. Notwithstanding all I had read and heard I was astonished at the color of the ice which, without exaggeration, was as deep as sulphate of copper. It advanced fifty feet last year.

At St. Petersburg the attractions for the botanist centre in the Botanical Garden, with its twenty-five well filled conservatories, a collection of hardy plants and trees of remarkable extent, considering the climate, and a large herbarium and library attached — all under the immediate care of Dr. Regel, formerly of Zurich, a scientific botanist as well as gardener. Dr. Trautvetter, however, is the official head of the establishment. There is a smaller but a choice herbarium at the Imperial Academy of Sciences, which since Ruprecht's death has been in charge of Dr. Maximowicz, who has travelled and collected largely in Mandchuria and Japan, and is now engaged upon a flora of the latter country. Though still young he has a high reputation as a botanist, and is an admirable man. To add to my satisfaction and comfort, he spoke English with facility. My special object was to examine the algæ of northwest America described by Ruprecht. These are in the Academy's herbarium, in the condition in which they were left by him, without much arrangement.

Of Moscow, with its domes and shrines and dingy splendors, I have nothing to say botanically; and the same of the continuous railway journey of one thousand three hundred miles from thence to Berlin, without sleeping cars. On arising I found to my disgust that the three emperors were expected in two days, and not a room to be had in any hotel. At length, however, I found a lodg-

ing close to the Linden. On calling at Professor Braun's I learned that he was in Brandenburg, happily away from the heat and crowd. Never before have I so suffered with the heat, which for six days has been intense; so great that walking was almost impossible, and the dust made the riding almost insufferable. The crowd has been growing greater and greater, but culminated last night when there was a serenade by seven hundred musicians in front of the palace. I think I should enjoy Berlin in winter, but now I am tired of the heat and dust, and emperors; and shall leave at once for Cologne on my way to Strasburg.

REVIEWS AND BOOK NOTICES.

New German Botanical Manuals.*—The two botanical text-books named below have now superseded all others in Germany. The first, uniform with a zoology by the same author, is admirably adapted for schools and colleges, being compact, clearly and concisely written, and copiously illustrated with woodcuts. All the subjects of any general botanical interest are touched upon, and, for this reason, it is an excellent book for amateurs who wish to keep up to the present state of the science without taking the time and trouble necessary for learning, practically, microscopic and systematic details. The greatest advance in botany, recently, has been made in the departments of anatomy and lower cryptogams where, unfortunately, more knowledge of the microscope is necessary than is possessed by the majority of botanical readers. In the book of Thorné, the frequent woodcuts take the place of microscopic work as far as such a thing is possible. On the whole, this is the best elementary botanical text-book which has yet been published in Germany.

The second work, although called a text-book, partakes much more of the character of an encyclopædia. In consequence partly of the high reputation of the writer as a vegetable physiologist, the book has had an almost unprecendented sale, the third edition being already nearly exhausted and a separate edition of the second part, relating to vegetable physiology, having just made its

* Lehrbuch der Botanik von Dr. Otto Wilhelm Thorné 2te auflage 1872. Lehrbuch der Botanik von Prof. Julius Sachs. 3te auflage 1873.

appearance. The proportion of those who buy the book and actually read it, however, is decidedly smaller than in the case of the first mentioned book. It is a work which gives an excellent summary of the present state of botany as it exists in Germany, particularly, of the results of recent studies in the cryptogams, and, as such, is a valuable book of reference for the special student and professor. It is much too intricate and full of microscopic details to be easily intelligible to the general reader. It is by no means the case, as some suppose, that the average botanical student in Germany is in a condition to profit by Sachs' Lehrbuch. In many places, without previous study of the lower forms of vegetable life, the book is quite incomprehensible. The text and woodcuts are excellent.—W. G. F.

THE MOLLUSKS OF WESTERN NORTH AMERICA.*—Under this title Dr. Carpenter reprints the reports made by him to the British Association, with other papers, which will make the volume of much value to malacologists.

BOTANY.

WERE THE FRUITS MADE FOR MAN, OR DID MAN MAKE THE FRUITS?—These need not be taken as mutually exclusive propositions; for as "God helps those who help themselves," and man's work in this respect is mainly, if not wholly, in directing the course or tendency of Nature, so there is a just sense in which we may say "the art itself is Nature," by which the greatest triumphs of horticultural skill have been accomplished. Moreover I am not one of those naturalists who would have you believe that nothing which comes by degrees, and in the course of nature, is to be attributed to Divine power.

The answer I should give to the question, as we thus put it, is:

1. Some fruits were given to man as they are, and he has only gathered and consumed them. But these are all minor fruits, and such as have only lately come within the reach of civilized man, or are not thought worth his trouble. Huckleberries and cranberries, persimmons and papaws are examples, taken from this country. Whether even such fruits have or have not been under a course of improvement, irrespective of man, is another question.

* Smithsonian Miscellaneous Collections, 252. Washington, Dec., 1872, 8 vo. pp. 325, 121.

2. Others have come to man full flavored, and nearly all that he has done has been to increase their size and abundance, or extend their season. Currants and gooseberries, raspberries and blackberries, chestnuts, and above all, strawberries, are of this class.

3. But most of the esteemed and important fruits, as well as the grains, have not so much been given to man as made by him. The gift outright was mainly plastic—raw material, time and opportunity. As to the cereal grains, it is only of the oat that we probably know the wild original; of wheat there has been an ingenious conjecture, partly, but insufficiently, confirmed by experiment; of the rest, no wild stock is known which is not most likely itself an escape from cultivation. Of some of them, such especially as maize, not only can no wild original be indicated, but in all probability none exists.

So of the staple fruits; of some the wild originals can be pretty well made out; of more, they are merely conjectural; of some they are quite unknown and perhaps long ago extinct.

To cite examples in confirmation or illustration of these points, to note how very ancient some of our varieties of common fruits are, and how very recent certain others—to consider how they have originated, with or without man's conscious agency, and how they have been perfected, diversified and preserved, mainly under man's direct care—would be to expand this note into an essay, and yet to say nothing with which pomologists are not familiar.

It would be curious to speculate as to what our pomology would have been if the civilization from which it, and we ourselves, have sprung had had its birthplace along the southern shores of our great lakes, the northern of the Gulf of Mexico, and the intervening Mississippi, instead of the Levant, Mesopotamia and the Nile, and our old world had been open to us as a new world less than four hundred years ago.

Seemingly, we should not have as great a variety of choice fruits as we have now, and they would mostly have been different, but probably neither scanty nor poor. In grapes, at least, we should have been gainers. Our five or six available species, of which we are now just beginning to know the capabilities, would have given us at least as many choice sorts and as wide a diversity as we now have of pears; while pears would be a recent acquisition, somewhat as our American grapes now are. Our apples would have been developed from *Pyrus coronaria:* and might have

equalled anything we actually possess from *Pyrus Malus* in flavor, though perhaps not in variety, if it be true, as Karl Koch supposes, that the apples of the orchards are from three or four species. At least one of our wild hawthorns, *Crataegus tomentosa*, in some varieties, bears a large and delicately flavored fruit, evidently capable of increase in size; it might have been in the front rank of pomaceous fruits. In a smaller way our service-berry would have been turned to good account. Our plums would have been the progeny of the *Chicasa*, the beach plum, and our wild red and yellow *Prunus Americana*, which have already shown great capacity for improvement; our cherries might have been as well flavored, but probably not as large as they now are. But instead of peaches and figs, we should be discussing manifold and most luscious varieties of persimmon and papaw, the former probably equal to the *kaki* just acquired from the far east. As to strawberries, gooseberries and currants, we should have lost nothing and gained something, as we possess several species besides the European types themselves; as to blackberries and raspberries we should have been better off than now, by the earlier development and diversification of our indigenous species. And we might have had all our finest strawberries a thousand or more years ago, these having come from our American types, *Fragaria Virginiana* with its varieties (which, as well as the old world *F. vesca*, occurs all across the continent), and *F. Chilensis* which ascends the Pacific coast to Oregon.

Then we should consider how much earlier our race, with an American birthplace, would have been in possession of tomatoes, of the pineapple, of the cherimoyer and the other custard apples, of the star-apples and other sapotaceous fruits, of chocolate, of Lima beans in all their varieties, of peanuts; not to speak of potatoes, sweet potatoes, and "Jerusalem" (that is, girasola or sunflower) artichokes: the last supplemented by our ground-nut (*Apios tuberosa*) would have been the first developed esculent tubers, and would probably have held their place in the first rank along with potatoes and sweet potatoes of later acquisition.

Among the causes and circumstances which have given to the fruits of temperate climates of the old world their prœminence, *opportunity* is one. How many potential fruits of value lie undeveloped in this country we know not, and now shall never know. They have lost their opportunity. Necessity, which is the mother

of pomology as well as of other invention, has been fully supplied out of other accessible, and in some cases no doubt originally better, materials.

There are some, however, for which evidently "a good time is coming." Of these, our wild grapes are foremost. They have such a start already, and seedlings, whether from crosses or otherwise, can be produced and selected and reproduced in so short a space of time, that they will probably have achieved their position when the American Pomological Society holds its centennial celebration.

Blackberries, from *Rubus villosus*, are in similar case; and if due attention be paid to the low blackberry or dewberry, and to the sand blackberry of New Jersey and farther south, the foundation for a greater diversity of excellent sorts will be laid.

As to cranberries, already an important staple, increase of size and abundance of production are all that are to be expected. It is easier to bring about improvements in the direction of sweetness than in that of acidity. Huckleberries, also, have probably nearly reached their perfection unassisted.

A few wild fruits may be mentioned which manifestly have great capabilities, that may or may not be developed in the future. The leading instances in my mind are the persimmon and the papaw,—not the true papaw, of course, which we have in Florida, but the *Asimina* or western papaw, so called. Both persimmons and papaws are freely offering, from spontaneous seedlings, incipient choicer varieties to be selected from; both fruit when only a few years old, thereby accelerating the fixation of selected varieties into races; and both give fruits of types wholly distinct from any others we possess of temperate climates. He that has not tasted a *kaki* has no conception of the capabilities of the *Diospyros* genus. The custard apples of the West Indies give some idea of what might be made of our papaw, when ameliorated by cultivation and close selection from several generations. I have understood that one of the veteran pomologists of the country, Dr. Kirtland, of Ohio, a good while ago initiated a course of experiments upon the papaw in this regard; it would be well to know with what success, and whether the breeding and selection have been continued through successive generations.

Our American plums, already mentioned, have for many years been in some sort of cultivation, and have improved upon the wild

forms; but I suppose they have not been systematically attended to. Their extreme liability to black-knot and other attacks renders them for the present unpromising.

Finally, if pomology includes nuts, there is a promising field uncultivated. Our wild chestnuts are sweeter than those of the old world; it would be well to try whether races might not be developed with the nuts as large as *marrons* or Spanish chestnuts, and without diminution of flavor. If we were not too easily satisfied with a mere choice among spontaneous hickory nuts, we might have much better and thinner shelled ones. Varying as they do excessively in the thickness of the shell and in the size and flavor of the kernel, they are inviting your attention, and promising to reward your care. The pecan is waiting to have the bitter matter between the shell and the kernel bred out; the butternuts and black walnuts to have their excess of oil turned into farinaceous and sugary matter, and their shells thinned and smoothed by continued good breeding; when they will much surpass the European walnut.

All this requires time, almost unlimited time; but it is not for those who are enjoying the fruits which it has taken thousands of years to perfect, to refrain from the good work which is to increase the enjoyments of far future generations.—Asa Gray, *in Horticulturist.*

ZOOLOGY.

Capture of a Gigantic Squid at Newfoundland.—We print the following letter from Mr. Murray, of the Canadian Geological Survey, kindly forwarded to us by Professor Agassiz shortly before his death:—

St. John, Newfoundland, Nov. 10, 1873.

My Dear Sir:—The following account of a remarkable marine monster, which made its appearance off the shores of this island, and of a severed arm or tentacle of the same, now in my possession, will I dare say be interesting to you, and also to Prof. Agassiz, to whom I should like to offer it.

On or about the 25th of October last, while a man by the name of Theophilus Picot was engaged at his usual occupation of fishing, off the eastern end of Great Bell Island in Conception Bay, his attention was attracted to an object floating on the surface of the water, which at a distance he supposed to be a sail, or the *débris* of some wreck, but which proved upon nearer inspection to be endowed with life. Picot, on observing that the object was alive, to

satisfy his curiosity pushed his boat alongside, and I believe struck at it with an oar or boat-hook, whereupon the creature's fury seemed to be aroused, and it struck at the bottom of the boat with its beak, and immediately afterward threw its monstrous tentacles over the boat, which probably it might have dragged to the bottom had not Picot with great presence of mind severed one (or more) of the tentacles with his axe. A part of this tentacle or sucking arm I have now in my possession, immersed in spirits. I send you with this letter a couple of photographs of the said tentacle and a few of the small denticulated sucking cups, all of which I hope will reach you safely.

Picot's description of this great squid, cuttle or devil-fish is this. He represents the body of the animal to have been about sixty feet long, and its general diameter as not less than five feet. The breadth of the tail he represents as at least ten feet. He states that when the creature found itself mutilated it made off backwards or tail foremost, after the manner of squids, darkening the water over a large space with inky emissions. The enormous proportions given above might appear to be exaggerations, were they not to a great extent borne out by the fragment of the animal which was severed, and of which the photograph will give you a fair idea. The tentacle measured on the 31st of October, when I first saw it, after it had been several days in strong brine and shrunk in consequence, seventeen feet; but was said to have measured nineteen feet previously. When it was first landed at a place called Portugal Cove, in Conception Bay and within nine miles of St. John, some six feet was cut off the inner end of this arm, and Picot asserts that the original incision was at least ten feet from its articulation with the body. Accordingly the whole length of the said arm must have been from thirty-three to thirty-five feet. The beak or bill of the creature Picot described as being about the size of a six gallon keg.

The Rev. Mr. Gabriel now residing at Portugal Cove, but who formerly resided at a place called Lamalein on the south coast of the island, states that, in the winter of 1870 and 1871, two entire cuttle or devil-fish were stranded on the beach near that place, which measured respectively forty and forty-seven feet.

The man Picot says he saw the animal very distinctly for some time after it had been mutilated, swimming stern foremost with its tail above the water's edge, and that its general color was a pale pinkish, resembling that of the common squid.

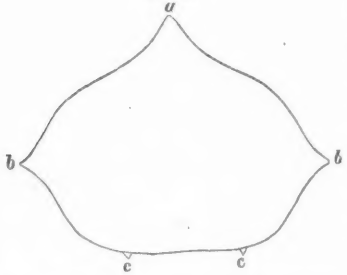
The following is an exact copy of the memoranda I made on first inspecting this remarkable tentacle on the 31st of October. The total length of the fragment from the last incision to the extremity, seventeen feet. The extremity of the arm or terminating two and one-half feet is flattened, and somewhat in shape like a narrow paddle, tapering toward the end to a sharpish point. The

thickest part of this terminal appendage is about six inches in circumference.

The inner fourteen and one-half feet is rounded in form, varying in thickness from three and one-half to four inches in diameter, or about the size of an ordinary man's wrist. On what I shall call the ventral side of this fourteen and one-half feet, there is a set of small tubercles or mammillary processes, which, at the end nearest the articulation, are about two feet apart, but become much closer and more numerous towards the extremity. Some small valve-like sucking denticulated cups are distributed along the area near the tubercles. Examples of these you will find in the small pill-box.

At the extreme point of the paddle-shaped extremity, and also at its junction with the rounded part, there is a cluster of small denticulated sucking cups, each cluster containing from fifty to seventy individual cups. The smallest of these is not larger than the head of a pin. The broad paddle-like part between the two clusters is armed with a double row, twelve in each, of gigantic suckers, without teeth, each individual measuring about one and one-fourth inches in diameter.

Fig. 44.



a, dorsal ridge; *b*, flanges of thin membranes; *c*, ventral tubercles.

A section across the middle part of the arm is of the following form, somewhat flattened (Fig. 44).

The whole tentacle, as coiled up for the photograph, measured two feet, four and one-half inches on the longer diameter. The photograph is one-fourth the natural size.

Hoping I have made myself intelligible and that I may hear from you shortly what Agassiz says about the singular creature, I am, my dear sir, yours very truly, ALEX. MURRAY."

The following second letter from Mr. Murray to Prof. Agassiz seems to refer to another individual, but much smaller: —

"I send you with this two photographs of the creature in question, one being the head and tentacles, the other the body. The latter part has unfortunately been a good deal mutilated while being extricated from the net in which it was caught. The head was cut off and the eyes destroyed, but I hope you will find the remainder sufficiently well preserved for description and restoration.

My own descriptive memoranda are as follows: — Caught at Logia Bay, near St. John, Newfoundland, Nov., 1873. Total

length of body seven feet, circumference five feet, tail fan-shaped, pointed at the middle extremity, and between extremes of extended appendages measures upwards of two feet. Two tubes run the whole length of the body, one of which contains the inky fluid, the other water. The eyes of this individual have been destroyed, but the socket of one is attached to the neck, the diameter of which is four inches. In the centre of the head, there is a powerful beak of black and orange color. In shape the beak exactly resembles a parrot's.

Around the head there are eight large arms each from six to seven feet in length: two of which are nine inches in circumference; two of eight inches; and five of seven inches. These tentacles are covered with suckers on the lower side for their whole length, all denticulated, about one hundred sucking cups upon each arm. There are also two long slender tentacles, each measuring twenty-four feet in length, the average circumference of the rounded part of which is under three inches. The extremities of these longer tentacles are paddle-shaped, and armed with about eighty denticulated suckers. In this case both the greater and the smaller suckers are armed with teeth.

Photographs taken by Messrs. Parsons and McKenna, St. John, on Tuesday, Dec. 2, 1873. A very respectable person, by the name of Pike, informs me that he has seen many of these gigantic squids upon the coast of Labrador; and that he measured the body of one eighty feet from beak to tail. He also states that a certain Mr. Haddon, a school inspector of this place, measured one ninety feet. He tells me, moreover, that the monsters are edible.

The man Picot who produced the first specimen of a tentacle, stated to Mr. Harvey that he had his boat alongside of the animal; that the boat was twenty feet long, and, as near as he could judge, it was about one-third the entire length of the creature's body."

[We would refer our readers to an account of colossal cuttle-fishes on p. 87 of vol. vii of this journal, and the notice of *Architeuthis dux* found in the North Atlantic. Professor Verrill of Yale College writes us that he has received both jaws and two suckers of the Newfoundland cuttle-fish. The beak, he says, agrees nearly with the figure of that of *A. dux*, on p. 93, of vol. vii, but the jaws are somewhat larger, he thinks. — Eds.]

A New (?) Ægerian Maple Borer. — In the description of a supposed new maple borer on page 57 of the January number, I recognize an old acquaintance which vies with *Chrysobothris femorata* in killing the shade maples of the Mississippi Valley, and which is not unfrequently found in the eastern states. I have been familiar with its work for nine years, and it has long been

known as *Ægeria acerni* Walker (*Trochilium acerni* Clem.).—C. V. Riley, *St. Louis, Jan.* 20, 1874.

The Anatomy of Worms.—Claparède's elaborate posthumous work with fifteen plates, on the anatomy of the sea worms, appears in the "Mémoires de la Société de Physique et d'Histoire Naturelle of Geneva.

GEOLOGY.

The N. W. Wyoming Expedition.—The summer of 1873 is noted for the number of expeditions which were organized for the purpose of explorations in the territories, and the almost uniform success which has resulted, from a scientific point of view. Among all of these none has perhaps attracted so little attention as the small band which quietly set out from Omaha on the second day of last June, with the purpose of accomplishing, with the smallest possible appropriation, what three successive parties, led by the most intrepid and daring explorers of the western country, had pronounced impossible.

This expedition, in a tour of some eight or nine hundred miles, made a careful topographical, geological and botanical survey of a large portion of unexplored territory in N. W. Wyoming, adjacent to the National Park, and connected the whole with the work of previous explorers by a complete reconnoissance of the park itself. The principal geological results have already been published in outline,* and the writer has prepared a paper for the Naturalist, relating more especially to the features of the Yellowstone Park, I must therefore content myself, in this place, with a very brief account of the most important results of the expedition.

Besides the unravelling, in a great measure, of the complicated mountain system of the great central water-shed of North America, the head waters of the three great rivers which here diverge, as from a focal point,† were explored and mapped, and several new passes were discovered, through the rugged walls of the Sierra Shoshone‡ mountains. After a successful tour of the whole of the reserved tract, during which ample collections were made, the party ascended the valley of the Upper Yellowstone River, rediscovering the "Two Ocean Water" of Lewis and Clarke, which has

*American Journal of Science, December, 1873.

†Missouri, Colorado, and Columbia rivers.

‡Name given by Capt. W. A. Jones, commander of the expedition, to the snow-clad walls upon the east of the Yellowstone Lake.

recently been pronounced a myth. This interesting phenomenon is nothing more nor less than a mountain stream which, flowing down the mountain side, at its base splits quite curiously into two distinct streams, one going northerly to the Upper Yellowstone River, thence *via* the Missouri and Mississippi rivers to the Atlantic waters; the other, flowing southerly, reaching the Pacific ocean by way of Snake River and the Columbia.

But the greatest geographical result, as well as the most important for other reasons, was the discovery of a pass through the Wind River range of mountains, at its northern limit, which renders the park accessible from the head of Wind River. This was one of the main objects of the expedition, the "*impossibility*" of its forerunners.

While it is impossible to give, in detail, the work of the several departments, it may be said that all was accomplished in the most thorough manner, as the reports will show when completed. In geology, the collections comprise specimens from all of the western formations, from the metamorphic rocks to the most recent, including material of volcanic origin and from the drift, as well as geyser and hot spring deposits in quantity. Many of the recent products are fully as interesting as those of an older date, and the surface and dynamical geology of this region present a vast field for study.

I have dwelt upon the geology, because more specially interested in that subject, but the botanical and other results are no less interesting. No zoölogist accompanied the expedition to collect, but Mr. J. D. Putnam, assistant to Dr. Parry, obtained a number of insects besides attending to his regular duties. I also noted the larger and more common animals which I observed from time to time. Dr. Heisman, surgeon to the expedition, collected specimens of the water and many of the deposits of the springs and geysers, for analysis.

For a more extended account of these explorations I must refer to the articles before mentioned. — Theo. B. Comstock, *Geologist.*

Monkeys in the American Miocene. — Prof. Cope, while investigating the palæontology of Colorado in connection with Hayden's geological survey of the territories during the past season, detected the remains of what he states to be a quadrumanous mammal allied to the lemurs. It has been named *Menotherium lemur-*

inum, and was as large as the domestic cat. The existence of peculiar forms of lizard, serpents and lemurs constitutes points of resemblance to the Eocene fauna of Wyoming not previously recognized in our Miocene formations.

THE GENUS PROTOHIPPUS.—This form of horse is characterized, according to Leidy, by a peculiarity of the permanent teeth which belongs to the temporary teeth of *Equus*. Prof. Cope has recently obtained nearly complete skeletons of several species, and finds that like *Hippotherium* they have three toes. He describes a new species, *P. sejunctus*, in which the legs are considerably longer and the head relatively larger than in the true horse, having thus proportions of body, as well as dentition resembling the colt.

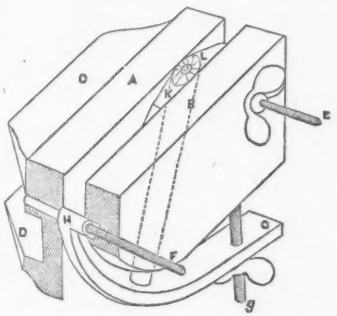
MICROSCOPY.

A NEW FORM OF MICROTOME.—The microtome in common use consists essentially of a round hole in which the object is wedged, and forced above the guiding surfaces of the instrument by a screw acting beneath. Various forms are to be found that differ in size, but agree in principle, that of Beck being, perhaps, as convenient as any, though I have used one consisting of a disk furnished with a graduated series of holes and revolving so that any desired aperture could be brought over the screw, which, for making sections of stems was much more desirable. Dr. Hunt of Philadelphia has the apparatus set in a freezing box, thus making a refrigerating microtome, and by bedding animal structures in soap, which expands and fastens them more strongly than paraffine or other compositions used for that purpose, it answers very well.

But having occasion to cut a number of plant tissues, especially fern stems, I found it very desirable to have oblique sections, to show more perfectly the scalariform tissue, and the only way I could accomplish this with the ordinary instrument was to cut a diagonal crease in the flat sides of a split cork, to hold the stem, and, inserting the cork, cut the whole as one piece and sort out the ferns from the cork. Some tolerable sections were obtained in this way, but the results were generally so unsatisfactory that I was led to devise a new instrument capable of more adaptation, the construction of which is shown in the accompanying figure. *A* and *B* are guiding surfaces (in my instrument of glass), formed

on two parallelograms of metal, the outside of *A* carrying lips *C* and *D*, the latter provided with a thumbscrew by which it can be fastened to a table. The front ends of *A* and *B* in the drawing are cut off to show the arrangement of the rods *E* and *F* that are firmly inserted in *A*, but permit *B* to slide freely on them. They are threaded on the outer ends and have thumbscrews by which *B* can be pressed to *A;* the thumbscrew on *F* not shown. *H* is a sleeve on *F* forming one end of the curved lever *G*, that has a motion regulated by the screw *I* hanging from the rod *E*.

Fig. 45.



To use the instrument some narrow pieces must be provided equal in length to the depth of the instrument. These pieces I call blanks, and they may be of rubber, paper, or wood, slightly thicker than the stem to be cut, which stem should not be more than half as long. A follower is also required as large as the stem and so long that with the stem it will reach from the guiding surfaces to the lever *G*, when the latter is pressed down as far as *I* permits. Laying the instrument on its side remove *B*, lay the stem on *A*, at any desired angle to the guide, bring a blank up to it on either side, insert the follower, replace *B*, screwing it up tight, and by the screw *I*, which should be very fine, the lever *G* forces the follower and stem above the guides as in the old instruments. For animal tissues, they are bedded in soap in little paper boxes, and when cold the mass is treated as a stem. A vessel with an inner lip to hold the microtome, and screw working through the bottom, makes it refrigerating. Longitudinal sections of wood are beautifully cut, by clasping one end a little tighter than the other, against which the follower works, the section thus commencing at nothing. Of course a variety of followers and blanks can easily be provided to suit various cases, and a little manual tact is required, but in my hands I find it takes less time for manipulation than any other instrument, with a range of work before impossible. — Wm. H. Seaman, *Howard University.*

NOTES.

We make the following extract from Mr. Milne Holme's late address before the Edinburgh Geological Society: —

"In America every state has its state geologist, with assistants, whose duty it is not merely to map discoveries by others, but to make researches. A specimen of the work done by one of the American state geologists, I have brought here this evening. It far exceeds, in fulness of detail and artistic skill, anything which I have seen produced by our government surveyors."

By the report of the Director of the New York Central Park menagerie, we notice that the number of animals on exhibition during 1873 was eight hundred and six, an increase of two hundred and five over the previous year. Among them are a manatee and a tapir, the first of the species ever imported to this country.

Prof. Asa Gray has been appointed one of the Regents of the Smithsonian Institution, in place of the late Prof. Agassiz.

ANSWER TO CORRESPONDENT.

H. K. H., Mich. — The caterpillar you sent formed a cocoon in the box and disclosed the moth. — *Tolype velleda* Stoll.

BOOKS RECEIVED.

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Fourth Annual Report of the Commissioners of Fisheries of the State of New Jersey for the year 1873. 8vo, pp. 32. Trenton, 1873.

On the Structure and Affinities of the Brontotheridæ. By O. C. Marsh. 8vo, pp. 6. 2 plates. (From Am. Jour. Sci. and Arts, Vol. vii, Jan. 1874). Rec'd Jan. 5, 1874.

Note Additionelle au Memoire de M. W. T. Brigham, intitule, Volcanic Manifestations in New England. By Albert Lancaster. (Memoirs Boston Soc. Nat. Hist., Vol. ii, Part ii, No. iv) 4to, pp. 7. Boston, 1873.

Embryology of Terebratulina. By Edward S. Morse. (Memoirs Boston Soc. Nat. Hist., Vol. ii, Part iii, No. i). 4to, pp. 16. 2 plates. Boston, 1873.

Explorations of 1872: U. S. Geological Survey of the Territories under F. W. Hayden; Snake River Division. 8vo, pp. 14. (From Am. Jour. Sci. and Arts, Vol. vi, Sept., 1873.)

Twenty-first Annual Report of the Trustees of the Peabody Institute of Peabody. 8vo, pp. 28. Peabody, 1873.

Louis Agassiz as a Teacher of Science. (Remarks of Prof. D. C. Gilman, at the Memorial Meeting of the California Academy of Sciences, Dec. 22, 1873). 8vo, pp. 8.

The Origin and Propagation of Disease. (Anniversary Discourse delivered before the N. Y. Academy of Medicine, Nov. 20, 1873). By John C. Dalton. Appleton & Co., New York, 1874.

Manual of Physical Geography and Institutions of the State of Iowa. By C. A. White. Small 4to, pp. 85. 3 maps and several woodcuts. Day, Egbert & Fidlar, Davenport, 1873.

Anwendung der Darwinschen Lehre auf Bienen. By Hermann Muller. 8vo, pp. 92. 2 plates. Bonn.

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